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THE

VEGETABLE WORLD.

By CHARLES WILLIAMS.

'———— Not a tree,
A plant, a leaf, a blossom, but contains
A folio volume. We may read, and read,
And read again; but still find something new,
Something to please, and something to instruct,
E'en in the noisome weed.'

Hurdis.

First American Edition.

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PREFACE

TO THE AMERICAN EDITION.

THERE is no study which has been clothed with so much fictitious tediousness, and none which has been so much neglected, as that of Botany, or an inquiry into the Vegetable World. This has not only been the case with children and youth, but those of more advanced years have neglected to take an interest in one of the most fruitful and grateful sources of instruction, — a source which is filled with so much wonder, and so productive of conviction of the benevolence of our Creator.

When this fact is considered, we must esteem those as benefactors, who labor to throw a charm and interest around the subject, in order to an inducement to a more thorough examination and

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discovery of the hidden glories of the carpet of the earth. Who that considers attentively the rose, the lily, or the simplest blade of grass, but breathes a prayer of gratitude to the God of Nature, that all things are so perfect and beautiful?

It is with the hope of adding some inducement to a more general inquiry into this subject, that this work is respectfully submitted to parents, guardians, and instructers of youth. It is by an author of well-earned and deserved celebrity in England, — and his works have only to be read, to be equally prized in this country. The ease, simplicity, and purity of language with which the facts are delineated, cannot fail to interest all, and make it particularly applicable to the wants of children and youth.

INTRODUCTION.

'Oh, mamma!' said a fine, bright-eyed little girl, as she laid down a volume, entitled Art in Nature, and Science Anticipated, 'I wonder where the Elwoods live! I should like to know what they have been talking about lately. I am sure I should be pleased to see Emma; I wonder whether she is short or tall — what colored hair she has — and if she has learned to sing about 'the snug little nest!' And, then, what a nice play-fellow Frederick would be for George! And he could tell him so many things, for he must be very clever. Oh, how I wish they were here!'

It is hoped, therefore, that this record of the following year's conversations of the Elwood family will, in part, supply the want of personal acquaintance, and be as acceptable to the young as its predecessor.

CONTENTS.

THE EARLY PRIMROSES.....9
THE DISCOVERY.....32
THE WALK.....53
THE PROMISE.....75
THE CONSERVATORY.....96
CHANGES.....119
THE DESSERT.....135
A SUMMER EVENING.....157
THE AGED TREE.....172
THE ENIGMA.....184
THE THREE REGIONS.....199
ALTITUDES.....210
PERSIAN SAGACITY.....219
THE LAST ROSES.....235
AN AUTUMNAL MORNING.....246

THE

VEGETABLE WORLD.

THE EARLY PRIMROSES.

'I AM so glad, papa—I am so glad!' said Frederick, as he entered the room in which Mr. and Mrs. Elwood were sitting; to whom his sister Emma had just been playing and singing a delightful air.

'And what makes you so buoyant and happy this morning?' inquired his mamma.

'Why, mamma,' he replied, 'spring is coming; and though I like the long evenings, when Emma and I sit with you and papa, and read and talk of distant countries and famous people, yet I like spring better; because, besides hearing of *them*, we can walk and ride so much more; the gardens, the fields, and the woods, begin to be so beautiful.'

'All the seasons have their pleasures,' said Mr. Elwood; 'but now you sympathize with the poet who said:—

'Come, smiling hope! anticipation come—
To fancy's eye disclose the joyous spring;
Lead where the snow-drop and the crocus blows;
Bring violet perfumes on the breeze's wing;

Unclasp the primrose ; bid the cowslip fling
Its incense back to heaven ; let matins rise,
Till in imagination's ear shall ring
Each love-told hymn that swells the April skies,
Ascending up to Him, all-potent and all-wise.'

But the morning is by no means a cheerful one ; mamma has just been complaining of its chilliness, and the clouds seem gathering for a storm. What excited, my boy, these warm expectations?'

F. A bunch of early primroses, papa, which I gathered from a richly sheltered bank ; I have asked that they may be put in water, and, when they are ready, I mean to present them, with my love, to dear mamma.

Mrs. E. Thank you, my love ; I like to be so affectionately remembered ; and now take your usual seat, and tell me in what respects one of these pretty flowers differs from a stone.

F. A flower has life, mamma ; and a stone has not.

Mrs. E. Very true, my dear. But, in addition to this, a plant is very wonderfully formed ; it is thus prepared to receive nourishment from the soil from whence it springs, and also to produce others like itself.

F. What parts, mamma, has a plant?

Mrs. E. One is called the cellular tissue. If, for instance, you take a thin transverse slice of the stem of any plant, or a slice cut across its stem, and you then put it into a drop of pure water, and place it under a microscope, you will see it consists chiefly of cells, more or less regular, resembling those of a honey-comb, or a net-work of cobweb. Their size varies in different plants, and in different parts of the same plant ; and

they are sometimes so minute as to require a million to cover a square inch of surface. This singular structure, besides containing water, fluid, and air, is the repository or store-house of various secretions; through it also the sap, when produced (as we shall presently see), is diffused sideways through the plant; and by it many changes occur in the juices that fill its cells. But papa will now describe the vascular system.

Mr. E. It consists of another set of small vessels. If, for example, a branch be cut transversely early in the spring, the sap will ooze out from numerous points over the whole of the surface, *except that part which the pith and the bark occupy;* and if a twig, on which the leaves are already unfolded, be cut from the tree, and placed with its cut end in a watery solution of Brazil wood, the coloring matter will ascend into the leaves and to the top of the twig. In both cases, a close examination with a powerful microscope will show that the sap perspires from the divided portion of the stem, and that the coloring matter rises to the top of the twig through real tubes. These are the sap, or *conducting* vessels of the plant. But if we examine a transverse section of the vine, or of any other tree, at a later period of the season, we find that the wood is apparently dry, whilst *the bark, particularly that part next the wood, is swelled with fluid.* This is contained in vessels of a different description from those in which the sap rises; they are found in the bark only in trees, and may be termed *returning* vessels, from their carrying the sap downwards, after its preparation in the leaf. The passage of the sap is

thought to take place, like that of the blood in us, from the regular expanding and contracting of the vessels; but to be certain is almost impossible, because of their extreme minuteness; as, according to numerous observations made with the microscope, their diameter seldom exceeds a 290th part of a line, or a 3000th part of an inch. Leuwenhoeck reckoned 20,000 vessels in a morsel of oak about one nineteenth of an inch square.

E. Papa, I should think the vascular system is something like our veins and arteries.

Mr. E. There is such a resemblance, my dear. A plant has also tracheæ, which are composed of very minute elastic spiral tubes, and convey air both to and from the plant.

There are also fibres, composed of collections of these vessels and cells, closely united together. These form the root and stem. If you attempt to cut them transversely, you will meet with difficulty, because you have to force your way across the tubes, and break them; but if you slit the wood lengthways, the vessels are separated without breaking. Delicate as they are, they are carefully and wonderfully preserved from injury, so that they are not crushed by the pressure of the bark, or of the surrounding parts. The layers of wood, which appear in the stem or branch of a tree cut tranversely, consist of different zones of fibres, each the produce of one year's growth, and separated by a coat of cellular tissue, without which they could not well be distinguished. There is also the cuticle, which extends over every part of the plant, and covers the bark, which consists of three distinct coats. The liber, or in-

ner bark, is said to be formed of hollow tubes, which convey the sap downwards, to increase the solid diameter of the tree.

That of the Lagetto is very curious; it resembles net-work or lace, and hence it is called the Lace-bark tree. This bark is very beautiful, and consists of several layers that may be easily drawn out into a fine white silky web, three or four feet wide, like lace or gauze, and it has often been used for ladies' dresses. A celebrated botanist says that it may be washed without injury. King Charles the Second is said to have had a cravat made of this web presented to him by the Governor of Jamaica, of which island, and of Hispaniola, it is a native.

E. That is very singular. Do plants ever sleep, papa?

Mr. E. Oh, yes! Some, like a few of our birds, more of our insects, and almost all our forest beasts, seem to sleep through the day, and to awake and become active at night; while the greater number of plants, as well as animals, resign themselves to sleep at sunset, and appear re-invigorated with the dawn. To give you an example: the flowers of one class* are called Papilonaceous, a word taken from Papilio, the Latin for butterfly; and those of this tribe generally spread out those parts which are called their *wings*, in fine weather, to admit the rays of the sun; and fold them up again at the approach of night. The fact was first observed by Linnæus. Some seeds of one of these plants

* Diadelphia, order Decandria.

were given him by a friend, and, having sown them in his green-house, they soon produced two beautiful flowers. The gardener was absent when these were first observed; and in the evening, when Linnæus took him with a lanthorn to see them, they were no where to be found; so that he himself supposed they had been destroyed by insects, or by some accident; but the next morning, to his great surprise, he found his flowers just where they had been the day before. That evening, too, they were not to be seen, but the next morning they looked as fresh as ever. The gardener said, 'These cannot be the same flowers; they must have blown since.' But Linnæus was not so easily satisfied; as soon as it was dark he once more visited the plant, and, after lifting up all its leaves, one by one, he found the two flowers folded up, and so closely concealed under them, that it was impossible, at first sight, to discover what they were. This led him to observe other flowers of the same tribe, when he found that all of them, more or less, closed at night, and this he called 'the sleep of plants.'

Mrs. E. We must now attend to the root, which is not only designed to support the plant by fixing it in the soil, but also to be a channel for the conveyance of nourishment. It is therefore furnished with pores, or spongioles, as they are called, from their resemblance to a small sponge, to suck up whatever comes within its reach, as a lump of sugar absorbs the liquid into which it is put. Roots are various in their form, and are hence adapted to a great diversity

of soils and circumstances. The root of the orchis is very singular. It has two lobes somewhat like the two parts into which a bean is divided; one of these perishes annually, and another shoots up on the opposite side of the other; and, as the stem rises every spring from between the two, the plant moves a little onwards every year.

E. Why, then, mamma, if it only lived to be old enough, it would travel all round the garden! But it would take a long time to do that, for I find it is a very slow traveller, just like our friend Mr. Churchill, who says that, when he was young, he could ride sixteen miles an hour, but, now he is old, he manages to ride only a mile in two!

Mrs. E. Indeed, my dear! I have heard, too, that a willow-tree was dug up; the head was then planted in the ground, and the roots stretched out in the air like naked branches. But the roots, in course of time, became branches, and the branches roots; or rather, roots sprouted from the branches beneath, and branches shot out from the roots above. Some roots last one year, others two, and others live, like their shrubs and trees, for an indefinite period; but they all consist of a collection of fibres composed of vascular and cellular tissue, but without tracheæ, or breathing vessels.

Mr. E. The plant needs also a stem, through which the sap circulates, and from which the leaves and flowers spring. Sometimes this is seen, as in the rose, and at others it is hidden, like the stem of the tulip, which is

shut up in the bulb. Some of the valleys of the Alps are covered with willow-grass, and it is difficult to guess its origin, but it is, in fact, the extremities of the branches of a large willow-tree.

E. Oh, papa!—how does that happen?

Mr. E. Suppose a willow to grow at the foot of a mountain, and the earth which is annually carried down by the rains to bury the young plant; and then, its growth having been thus checked, and the sap, which would otherwise have been expended in foliage, being accumulated in the little stem, there will be sufficient nourishment for a *double* shoot; and two little branches will appear next spring. These flourish but for a season, and are buried; but the following spring, four stems are produced; these, undergoing the same process, yield eight; and, as the plant thus annually doubles its sprouts, and the soil rises, a verdant plain is gradually formed of the leaves of the willow-tree. The age of these willows has been found by digging down the side of the plain, and observing how often the shoots have been renewed; the lower they go, the more do the branches increase in size, and diminish in number, till, at length, they reach the single and original stem.

F. What is the use of the stem, mamma?

Mrs. E. It distributes the nourishment taken up by the roots to the several parts of the plant. The seat of vitality seems to be in the point or spot called the neck, which separates the stem from the root. If the root of a young plant be cut off, it will shoot out afresh; if the stem be

taken away, it will be renewed; but, if this part be injured, the plant will certainly perish.

Mr. E. Some stems are very remarkable. That of the sugar-cane sometimes grows to the height of twenty feet. The stems of the bamboo, a species of reed found in the East and West Indies, and America, are almost solid when young, but become hollow as they grow older, except at the joints. I will read you a description of some:— 'Among the trees which attracted our attention,' says Dr. Walsh, in his Travels in Brazil, 'were the different species of bamboo, some of which were of enormous size, and some of singular beauty. Of the first kind were many that measured two feet in circumference, sending out large lateral branches, and so tall as to resemble forest trees. Others, of equal magnitude, without any branches, shot out a single stem, divided into regular joints, smooth and tapering to a point, till they attained an immense height. Some were not so thick, but ran up till they became so slender that they bent down, gradually tapering to a very fine point, as thin as a horse-hair, and waving across the road like long fishing-rods. I cut one of them which had shot up from the valley below, about the middle, where it was not quite so thick as my wrist. After carrying it some time in my hand, where it felt lighter than a cart-whip, I laid it along the road, and measured its length, and found it fifteen yards long, so that the entire plant must have been ninety feet, tapering and polished the whole way with the most exquisite finish.' Another kind was so prolific that it covered the whole surface of the

forest, climbing to the tops of the highest trees, and clothing them with the most exquisite verdure. Sometimes it ran from tree to tree, covering the whole sloping surface of a glen with a level uniform curtain of the richest drapery. This vegetable substance is called 'the grass of the thicket.' It yields the cattle a supply of green and wholesome fodder at all seasons. A great part of the soil of India is covered with forests of bamboo. This tree is adapted to various purposes. It is used in building, for furniture, and fishing implements, and to support a kind of litter, or bed, called a palanquin, which is carried about on the shoulders of men, and used as a sedan-chair is here.

E. But how can hollow reeds be so strong?

Mrs. E. Whatever is cylindrical, my dear, is much stronger than what is solid, when only the same quantity of matter is used. The woody part of the smaller sorts of trees is generally in the centre, which makes them pliable, while, in the trunk, it stands round the centre at some distance from it, and thus gives strength to the stem, and is favorable to its upright growth. Some stems grow *internally*, and others *externally*. To the former class belong the sugar-cane, the date, the palm, the cocoa-nut tree, and most others of tropical climates. It might be thought that the new layers of wood, growing in the inner part of the stem, would burst the outside; but this becomes, on the contrary, closer, and more compact, until it will yield no longer, having attained its full growth. It then begins to shoot upward. In plants that grow externally,

the process is far more complicated; the wood consists, at first, of the pith—a soft substance which occupies the centre of the stem, and is almost always cylindrical—the layer that then surrounds it grows freely during a twelvemonth; but the following year it is enclosed by a new layer; and, compelled to yield laterally or sideways, it makes its way upwards where there is no pressure, and thus the stem grows in height at the same time that it increases in thickness. Other layers take the same course, and they attain moturity when they become so hard, by continued pressure, as to be no longer able to yield to it. Previous to this, they are called alburnum, or white wood, for wood is always white, not excepting even ebony, until it reaches this state. The alburnum has, in deal, a whiter color, is more spongy, and less durable, than the more perfect or heart-wood, as it is termed. If you count the number of layers at each end of a log, you will see how many years that part of the tree was in growing; thus, if there are thirty at one end, and twenty at the other, the tree was ten years growing that length. The annual layers of woods are separated by layers of the cellular system.

Mr. E. The layers of the bark grow internally, like those of the palm-tree; and, if a silver wire or blade be passed completely through the bark of a tree, the new internal layers, as they are annually formed, will gradually push it outward, till, at length, the internal coat becoming external, the wire will fall off. Thus inscriptions on the bark of trees are effaced; but, if

they are made so deep as to penetrate the layers of wood, the new layers of bark will preserve them. Adamson relates, that, in visiting Cape Verd, he was struck by a tree fifty feet in circumference. He recollected having read, in some old voyages, of an inscription on a tree like this, yet he could not discover one; but cutting into the tree, he found it entire, under three hundred layers of wood. Three hundred years had therefore elapsed since the inscription was made; and he calculated that the tree was probably about five thousand years old.

F. I suppose, papa, all plants find food in the earth.

Mr. E. No, my dear. Some are called aerial. Such are the most succulent or juicy plants of hot countries, among which are several of the palms and canes, and the greater number of those that adorn the fields of the Cape of Good Hope, where rain falls only for a few weeks in winter. A shrub from Jamaica* was long propagated here, in stoves, by cuttings; but, though they were freely watered, and grew several feet in length every season, they could never be made to produce any signs of fruit. It happened, however, that some young cuttings were laid aside and forgotten at Kew, and thus, having no water, and becoming dry as in their healthy state, every extremity produced a flower. Hence it has been thought that such plants derive the whole of their nutriment from the surrounding atmosphere; and that all the advantage they ob-

* Solandra grandiflora.

tain from thrusting their roots into the soil or sand is that of having an erect position.

Mrs. E. The air plants* are indeed no less singular than beautiful; they attach themselves to the driest and most sapless surface, and flower as if issuing from the richest soils. 'A specimen of one of these, which I thought curious,' says Dr. Walsh, 'I threw into my portmanteau, where it was forgotten; and, some months after, in unfolding some linen, I was astonished to find a rich scarlet flower in full blow; it had not only lived, but vegetated and blossomed, though so long secluded from air, light, and humidity.' The barren pine † is not less extraordinary. It also grows on sapless trees, and never on the ground. Its seeds are furnished, on the crown, with a long filmy fibre, like the thread of gossamer. As they ripen they are detached, and driven with the wind, having the long thread streaming behind them. When they meet with the obstruction of a withered branch, the thread is caught, and, revolving round, the seed, at length, comes into fixed contact with the surface, where it soon vegetates, and supplies the naked arm with a new foliage. In Brazil it grows like the common plant of a pine-apple, and shoots from its centre a long spike of bright scarlet blossoms. In some species, the leaves are protuberant below, and form vessels like pitchers, which catch and retain the rain water, furnishing cool and refreshing draughts to the heated traveller, in heights where no water is to be

* Epidendron. † Tillandsia.

found. The quantity of this fluid is sometimes very considerable, and those who have attempted to reach the flower-stem have been often drenched by upsetting the plant.

Mr. E. We should now attend a little to the leaves. These, when they first shoot, are generally enclosed in small scaly buds, evidently designed to defend them from the inclemency of the weather; but some leaves are of so hardy a nature as not to require a covering, especially when growing in a warm climate. Some buds sprout into flowers and fruits, others into fruit and leaves, and some into leaves and branches only. Germs seem to exist in every part of the stem, and wherever the sap accumulates, a bud appears. And here I may mention a remarkable fact. In Sweden, the budding and leaving of the birch-tree is taken as a guide for sowing barley. The idea originated with the illustrious naturalist, Linnæus, who urged his countrymen to observe most diligently and carefully at what time each tree unfolds its buds, and expands its leaves. This has been done, and Mr. Harold Barck has published the order of the leaving of trees in that country. Correct observations on the foliation of trees and shrubs in England have also been made by Mr. Stillingfleet. The first on his list is the honeysuckle, which is dated January 15, and the last, which is the thirty-sixth, is the Carolina poplar, dated April 22. The succession thus pointed out is invaluable, and provides the farmer with a calendar for spring. The discoloring of the leaves, and their falling off, will also guide him as to the approach of winter; and thus there

is 'a small still voice,' which may be regarded as the voice of God! Leaves usually last but one season. Evergreens change their leaves annually; the young leaves appear before the old ones decay, and thus the plant retains its verdure. The talipot-leaf is very remarkable. It is completely circular, terminates in the most beautiful rays, and folds up into plaits, like a fan. It is from three to four feet in diameter; its length and thickness are proportionate, and it can cover several persons from the inclemency of the weather. It is made into umbrellas of all sizes, and equally serves to protect the natives from the intense heat of the sun, and the rains which, at particular seasons, deluge their country. While they are falling, a native may sometimes be seen propping up one end of a talipot-leaf with a stick, and then creeping under it for protection. The leaf of the troolie, of Surinam, is said, however, to attain three feet in width, and thirty in length; the natives cover their houses with it, and it is very durable.

F. Papa, I should like to hear something about the sap.

Mr. E. The sap, which rises in the roots, consists simply of water, holding a variety of crude ingredients. All that is necessary is selected and retained to nourish the plant, and part is exhaled, or thrown out, by the leaves. During the spring, there is more than the usual quantity in order to nourish the young buds, which are then to appear. Thus the sap resembles the milk of animals, which is produced for a similar purpose, and which is provided only

when there are young to feed on it. Heat first expands the buds, and makes room for the sap. To show this, two pieces of vine were placed in two similar vessels of water, and the stem and branches of one of them were then introduced through a hole in the wall into a hot-house; the buds of this plant were rapidly unfolded, and the water in the vessel as quickly sucked up, whilst the buds of the other made only their usual progress, and the water was but slowly lessened. Having thus mentioned what may be called the *nurseling* sap, it should be observed that that which rises to feed the mature plant reaches the leaves without undergoing any change; but as soon as it arrives there it throws off a large portion of its water, leaving the nourishment it contained in the leaf. And it is remarkable, that, without *light*, no evaporation will take place, and it will even be inconsiderable, unless the sun's rays fall on the plant. This process has been called by some the transpiration of plants; and it was ascertained by Mr. Hales that a full-blown sun-flower, placed favorably as to light and heat, transpired twenty ounces of water a day, which is seventeen times more than is evaporated by a man, supposing their surfaces equal. Apples, plums, peaches, and other fleshy fruits have few or no pores, they, therefore, retain the moisture they receive from the sap, which enables them to remain long on the tree, after coming to maturity, without drying up or withering; whilst peas, and beans, and other dry fruits, wither, in consequence of the number of their pores. Leaves, too, vary in a similar manner, and with the same result.

E. What, papa, becomes of the sap that remains in the leaf after the moisture it does not want is gone?

Mr. E. Enriched by the nourishment which the moisture left behind, it now undergoes a change, as the blood in our frames does from the air which we inhale, but, with this difference, we give out what is called carbon, while, this being the principal ingredient of wood and all that is vegetable, the store of it in plants requires to be increased. A man exhales no less than eleven ounces a day, and plants receive it in large quantities. M. de Saussure transplanted fourteen periwinkles into vases, seven of which he watered with distilled water, and the other seven with water in its usual state. He afterwards found that the former had not acquired any carbon, whilst the latter obtained a considerable quantity; the wood being one-sixth heavier than that of the other. Plants, however, absorb oxygen during the night, and, combining with the carbon, it forms carbonic acid; but, during the day, the oxygen is restored to the atmosphere. How wonderful is this!

Mrs. E. The sap, changed by an acquisition of carbon, is called cambium, or returning sap, and passes into another set of vessels, which convey it downwards; and, as it traverses the several organs, it leaves in each what is necessary for their sustenance. Here, too, is a striking resemblance to what appears in the human frame. From one and the same blood, about twenty different fluids are separated; as unlike one another in their sensible properties—in

taste, smell, color, and consistency, as possible—thick, thin, bitter, sweet; and if we pass from our own to other species of animals, we find amongst their secretions, not only the most various, but the most opposite qualities—the most nutritious aliment and the deadliest poison—the sweetest perfumes and the most fetid odors. As the viper pours out a fluid fatal to other animals, and yet offers, in the general substance of his body, a sort of antidote to his venom, so the Indian cassava secretes in its root a juice or oil extremely poisonous, while its leaves are freely eaten; and even the root, deprived by heat of its juice or oil, gives bread to the natives, and tapioca as an article of commerce. Its starch, too, is like that of the finest wheat-flour, and, combined with potatoes and sugar, yields the grateful beverages—cyder and perry. Nor is this a solitary instance. Some of the secretions separated from the cambium are designed to remain in the plant, and others are conveyed out of it as useless or detrimental. Mamma will, I know, assist me in remembering a few of them.

Mrs. E. The honey-flower,* a Cape plant, produces more honey than any other, and in such abundance that a tea-spoonful may be collected every morning from each of its numerous flowers; though its strong and disagreeable smell, when bruised, indicates a poisonous quality. The tree that produces caoutchouc, or Indian rubber, which was first introduced into Eu-

* Melianthus.

rope about the beginning of the last century, is a native of South America and the West Indies. This substance is an elastic resin, obtained by making incisions in the stem. The juice is collected as it trickles from the wound, and moulds of clay, in the form of little bottles, are dipped into it. A layer of this juice dries on the clay, and several layers are added till the bottle is of sufficient thickness. It is then beaten to break down the clay, which is easily shaken out. The Indians make boots of caoutchouc, which are water-proof, and, when smoked, look like leather. The inhabitants of Quito prepare from it a kind of cloth, which they use as we do oil and sail-cloth; and, in the West Indies, flambeaux are made of it, that burn without a wick, and are used by fishermen when they go out to fish at night. Within the last few years, papa has had a cloak which it makes water-proof.

E. Oh, mamma! I know which it is; papa calls it his umbrella, because it keeps off the rain; but can you tell us how they use it?

Mrs. E. The caoutchouc is dissolved in naphtha, a brownish liquor obtained in making gas from coal, so as to form a varnish, with which thin cloth, or silk, or calico, is covered. As, however, the varnish is sticky, a second thin cloth is put over it, and the whole is passed between rollers, which make it quite smooth and of equal thickness throughout. I remember, too, the tallow-tree * is remarkable for the quantity and pe-

* Stillingia sebifera.

culiar quality of the oil obtained from its berries, which so nearly resembles wax or spermaceti, that candles are made of it; but they produce, in burning, a very disagreeable smell. Castor-oil is obtained from the seeds of a tree,* which, when ripe, are dried in the sun, pounded in wooden mortars, and then boiled in water, when the oil rises to the surface, is skimmed off, and put into jars for use.

Mr. E. The manchineal is found in the West Indies, and always grows on the beach. It bears a small, green apple, like a golden pippin, and of exquisite odor; but it contains an extremely caustic milk, with which it is said arrows have often been poisoned. Sailors are not unfrequently deceived by its appearance, and eat it; and to do so would issue fatally, were not an antidote provided in the juice of the sugar-cane. When it is to be cut down, as the wood makes beautiful furniture, it is necessary to have a fire made round it, to cause the juice to run out safely. A friend of mine mentioned, a few days ago, that he had often seen negroes who had gone incautiously near it, whose faces were dreafully swollen, and who were laid up in consequence for some days. A bush in the West Indies yields what are called soap-berries; the inner substance, which is of a yellow color, being often used, when ripe, for soap, while the berries, of which it is the covering, may frequently be observed made into necklaces and other ornaments.

E. I have often seen them, mamma; Miss An-

* Ricinus communis.

drews has a row of them, and bracelets to match: and I did not know what they were; but when I was at Mr. Selborne, the jeweller's, I saw some on the counter, and I asked him what he called them; and so I satisfied my curiosity without being so rude as to seem to notice Miss Andrews's necklace and bracelets!

Mr. E. I am glad you did so, my dear.—An American tree produces milk, and hence is called the cow-tree. It grows in rocky and barren districts, little adapted for the pasturage of cattle. It rises on the unfruitful side of a rock, with leaves dry and leathery, which, during many months of the year, are not moistened by a single shower. The branches appear dead and dry; but, when the trunk is pierced, a sweet and nourishing milk flows from it, which is most abundant at sun-rise; then the natives hasten from all quarters to the vegetable fountain, and receive the milk in large bowls.

Mrs. E. In America there is a small tree, about ten or twelve feet high, with crooked stems branching forth near the ground, and the leaves growing irregularly. Its flowers and dry blue berries make no show; the tree owes its beauty and value to the leaves; for these being bruised, as well as the bark of the young shoots, emit a delightful and refreshing fragrance, not exceeded by the myrtle or any other aromatic shrub. From the berries of a species of this tree, which grows commonly in Carolina, the inhabitants collect a wax, and hence it is called the candle-berry tree. In November and December, when the berries are ripe, a man, with his family, will remove

from home to some island, or sand-bank, near the sea, where these berries abound; taking with them kettles to boil the berries in. He builds a hut with palmetto-leaves, as a shelter during their stay of four or five weeks. He cuts down the trees, the children strip off the berries and throw them into the vessels; and, on their being boiled, oil rises to the surface, which, when cold, hardens to the consistence of wax. It is afterwards purified in other vessels; and candles made of it burn a long time, and yield a grateful odor.

Mr. E. Opium, so much used as a medicine to allay pain and occasion sleep, is the juice obtained from the unripe seed-vessels of a species of white poppy. In many parts of Asia Minor, whole fields are sown with its seeds, as our's are with corn. When the heads are nearly ripe, they are wounded on one side with a sharp instrument, and a white liquor flows out, which the heat of the sun hardens upon them; this is the opium: it is collected the next day, when fresh wounds are made on the opposite side of the seed-vessel; but what comes from the first incision is decidedly the best. When the opium is collected, it is moistened with a small quantity of water or honey, and worked on a board until it has the consistency of pitch, when it is formed into cakes or rolls for sale. The tincture of opium, which is made by dissolving it in spirits of wine, is called laudanum.

F. How, papa, is camphor produced?

Mr. E. Small quantities have been distilled from thyme, sage, and other aromatic plants; but it is obtained chiefly from the stems and roots of

the camphor-tree, a species of laurel which grows in China and in the Indian isles. But I will show you a singular property it possesses. See! I take a small piece of camphor, and place it on the surface of a basin of pure water, and now look!

E. O, how curious! It moves round, and round, and round, so fast!—but now I see it has stopped—please tell me how that happens.

Mr. E. I merely poured a single drop of lavender water into the basin, which caused the motion to cease; but no one has yet been able to explain *how* it is done.

Mrs. E. We must reserve other facts of this kind to future times, and now notice those secretions which consist chiefly of vapors and gases exhaled from flowers; one of which, that of the fraxinella, will burn if a taper be brought to it. Several peculiar juices, too, are prepared by glands situated on the surface of the leaves. These are furnished with hairs: in the nettle the hair gives the wound, and then its poisonous secretion is poured into it. If, however, the hairs are wetted by rain, no sting is felt, because they cannot penetrate the skin; and stinging plants can also be handled with impunity after death, if dried, for though the hair may be able to wound, the juice is no longer fluid, and cannot flow into the puncture.

Mr. E. How amazing is that power which produced vegetation!

'———— The Earth, till then
Desert and bare, unsightly, unadorn'd,
Brought forth the tender grass, whose verdure clad
Her universal face with pleasant green;

Then herbs of every leaf, that sudden flower'd,
Opening their various colors, and made gay
Her bosom, smelling sweet: and, these scarce blown,
Forth flourish'd thick the clustering vine, forth crept
The swelling gourd, up stood the corny reed,
Embattled in her field, and the humble shrub,
And bush with frizzled hair implicit. Last,
Rose, as in dance, the stately trees, and spread
Their branches, hung with copious fruit, or gemm'd
Their blossoms: with high woods the hills were crown'd,
With tufts the valleys, and each fountain side.'

THE DISCOVERY.

'An Indian, named Hualpa, was one day pursuing some deer, and climbing over some rocks, down which he was at length in imminent danger of falling. To prevent such an accident he caught hold of a bush; but his weight loosened its roots, and his peril was not diminished. While, however, he was holding the bush, and looking at the roots, to ascertain how far he might depend on them, he was astonished as he cast his eyes on a lump of massy silver. Aware of the value of his discovery, he took the treasure to his hut, lived on its produce some time, and repaired to the same spot whenever he wanted a supply. A neighbor observing Hualpa's condition improved, questioned him so closely that one day he revealed the secret. The two agreed to share the produce, and lived some time in social harmony; but, happening to quarrel, the confidant betrayed the secret to his master, a Spaniard, residing in the neighbor-

hood; and thus the mine became known, and has proved one of the richest in the world. There, my dear,' continued Mr. Elwood, 'is a story at your request—a proof that what is valuable is sometimes discovered by accident.'

'And I can give you another, papa,' said Frederick. 'A few days ago, when I was not thinking of flowers, I found a little bunch of primroses, and then you and mamma told us so much about plants, and their vessels, and stems, and roots, and leaves, and secretions, that Emma and I have been thinking and talking about them almost ever since. And we shall be so glad when you can relate to us more of their wonders. Perhaps—but I may be wrong—perhaps you and mamma could begin *now*. Ah! how kindly you smile!—I think—yes, I am sure, you will.'

'My dear boy,' replied Mr. Elwood, 'I am delighted to find you and your sister so desirous to learn what it is pleasing to impart. According to your request, then, we will give you, as opportunity permits, some interesting and instructive facts in reference to the vegetable world; having no doubt that these will excite and prepare you to commence a regular and methodical course of study in after years.

'I will begin this evening with the humble orders of vegetation. Among these are ferns, which have what is called their fruit arranged in spots or lines on the under side of the leaves; and if you will remind me of it in one of our walks, I will show you that a fern-root, cut transversely, exhibits a miniature picture of an

oak-tree. In times of famine they were used for bread, but now some of the common kinds are employed as firing by the poor, who also mix the ashes with water, and form them into balls, which, when dried in the sun, serve instead of soap. The leaves, if cut when full grown, and properly dried, make a thatch for houses more durable than straw; and of one root a sort of starch is made in the north of Europe. In several parts of the earth they assume the form and magnitude of trees; and, at the southern extremity of Van Dieman's Land, a species has been seen, whose trunk was from twelve to sixteen feet high. In describing their visit to the island of Huahine, Messrs. Tyerman and Bennet also describe some of great magnitude, and an interesting purpose to which others are applied. 'The sides of the mountain were overrun with forests of tall fern and dwarf shrubs. When we reached the top, which may be calculated at two thousand feet, we had to descend into a glen beyond, where the stream that supplies the fall has its source. The actual fall we ascertained to be three hundred and fifty feet. Of course, in its headlong career, the rounded volume, that rolls over the verge like molten crystal, expands into azure sheets, or darts in silver streams on its middle passage, tumbles into foam a little lower, and resolves into spray towards the bottom, so widely scattered that a bath may be taken under the effusion without any inconvenience. The face of the crags down which it rushes, and leaps, and spreads, and sparkles in the sun-beams being quite black,

gives intensity of brilliance to the many-colored waters, under all their changes of form, from the torrent above to the shower of dew-drops below. Here we gathered specimens of the elegant small ferns, with which the native women impress figures, in divers colors, upon their cloth—literally a method of *printing*, which is but one remove below the boasted invention of the Chinese by means of engraven blocks, before the art was discovered in Europe. It is true that the delicate patterns of leaves and flowers, taken from living plants, upon their apparel, may be said to teach these ingenious females only so many letters of the alphabet of nature; yet, though incapable of instructing them in anything else, they do always remind them of some of her most exquisite productions; and may often revive in recollection the places where such are to be found, as well as the circumstances under which particular specimens were gathered upon the spot—the weather, the company, the pleasures, or the disappointments of the day on which they were sought. But I must not forget that there is one species found in North America called the sensitive fern,* which is said to wither as soon as it is touched by a human hand, while it is not injured by the touch of other bodies.'

E. That is very singular, papa; but I have seen several sensitive plants, which shrink when anything approaches them, as if they were afraid. Can you tell us how this happens?

* Onoclea sensibilis.

Mr. E. Some have thought, my dear, that as plants have a set of vessels resembling our veins and arteries, they may also have what corresponds with the nervous system in animals. Among the experiments that have been made to prove this, certain vegetable poisons which are known to destroy life in animals, merely by acting on the nervous system, have been administered to plants, and the effect was, that the leaves shrunk or curled themselves up, afterwards became flaccid, and then in a few hours died.

Mrs. E. A plant has therefore, it is probable, some organs with which we are at present unacquainted; but I cannot see why it may not have nerves, when in so many respects it has a resemblance to ourselves. And now, papa, I will tell them a little about mosses, which, like lichens and fungi, whose vessels are all of a cellular form, have no vascular system whatever. They have roots and leaves something like those of other plants; but the fruit is very different, for small threads generally grow out of the bosom of the leaves and support little roundish bodies which contain the seeds. These capsules, as they are called, have generally a veil, like a little extinguisher; and when this is removed, the mouth of the capsule itself, which sometimes has a lid besides, appears surrounded with one or two rows of fringe, of great delicacy, and of amazing regularity in the number of the teeth that compose it. The mosses are generally evergeens, and capable of enduring more cold than most other vegetables. They clothe the rocks which rise out of masses of ice in Spitzbergen, and a botanist

counted above twenty different kinds in Greenland, without moving from the rock where he was seated. After having become dry and to all appearance withered, and even after they have been gathered and kept in a dry state for many years, yet, if put into water, every part of them will expand and become apparently as fresh and green as when they were growing. The effect produced by the structure or one of the mosses on the mind of Mungo Park, in the horrid wastes of Africa, I shall never forget. Frederick, my love, here is the volume, you may read his account.

F. (Reads.) 'I saw myself in the midst of a vast wilderness, naked and alone, surrounded by savage animals, and by men still more savage. I was five hundred miles from the nearest European settlement; I considered my fate as certain, and that I had no alternative but to lie down and perish. At this moment the extraordinary beauty of a small moss irresistibly caught my eye; and, though the whole plant was not larger than the top of one of my fingers, I could not contemplate the delicate conformation of its roots, leaves, and capsules, without admiration. Can that Being, thought I, who planted, watered, and brought to perfection, in this obscure part of the world, a thing which appears of so small importance, look with unconcern upon the situation and sufferings of creatures formed after his own image? Reflections like these would not allow me to despair: I started up, and, disregarding both hunger and fatigue, travelled forwards, assured that relief was at hand, and I was not disappointed.'

E. O mamma, that was delightful indeed! Can you tell us any of the uses of moss?

Mrs. E. I can, my dear; but I may just mention that Vaillant beheld, amidst the sultry deserts of the same country, a magnificnt lily growing on the banks of a river, which filled the air far around with its delicious fragrance, had been respected by all the animals of the district, and seemed defended by its own beauty. The sight awakened in his bosom greater exultation than perhaps a lily ever inspired before or since that period, and akin to that which his fellow-traveller has described. In answer to your question, however, I may say, the mosses are of great use They protect the roots of tender plants alike from the extremes of cold and heat; and there are many kinds, which, by vegetating in the shallow parts of ponds and marshes, convert, in the course of time, what was previously water and bog into useful land and fertile pastures. Birds employ these vegetables in constructing their nests; thus the goldfinch forms its cradle of fine mosses and lichens, collected from the apple or the pear tree, and then lines it with the down of thistles.

E. Oh, mamma! I can tell you such a pretty story, which I read the other day, about a little wren. She made a nest inside a cow-shed, and it was so neat!—and what do you think she did to hide the place? Oh, the little cunning thing! She hung a ragged piece of moss on the straw-work, and shut out the opening; nor would this have been known, had she not popped out one day, so that a gentleman saw her.

Mrs. E. That was certainly very clever, Em-

ma; but now I will tell you what service these apparently insignificant plants render to men. Of the golden maiden-hair,* one of the largest species, the Laplanders make good beds, by cutting thick layers of it, so that one serves as a mattress, and the other as a coverlet; and on such a bed Linnæus often slept when travelling among that people. These beds are elastic, so that they may be rolled up into a parcel and carried under a man's arm; nor do they grow hard by pressure, for when they lose a part of their elasticity by long use, it can soon be restored by dipping them in water. Of another kind, which is particularly soft, like a thick fur or fleece, the Lapland women make great use. They wrap their infants in it, without any other clothing, and place them in leathern cradles, lined with the moss; and in these soft and warm nests the babes, like little birds, are completely defended from the cold. The Greenlanders use this moss as tinder, and for wicks to their lamps. Another species ought also to be particularly mentioned: it is the rein-deer moss, † of a whitish color, which grows in Lapland to the height of at least a foot, covering the ground like snow. This is the most useful vegetable that is found throughout that country; for it is the principal food of the rein-deer, without which valuable creature the inhabitants could scarcely exist. The rein-deer draws them in sledges over countries buried in snow; its flesh and milk affords them nourishment, its skin clothing, and even its bones and sinews are made into several useful articles.

* Polytrichum commune. † Lichen rangiferinus.

Mr. E. De Broke thus illustrates the instinct with which the rein-deer discovers its means of subsistence: 'The flatness of the country increased as we proceeded, and at times it was even difficult to tell whether we were moving on land or water, from the uniformity of the white surface around us. In this respect, our deer were far better judges than ourselves; as, though there might be a depth of some feet of snow above the ice, wherever we stopped for a few minutes upon any lake, in no one instance did they attempt to commence their usual search after their food; yet, when upon land, their natural quickness of smell enabled them to ascertain, with almost unerring certainty, whether there was any moss growing beneath them or not. By the fineness of this sense of the animal, the Laplanders are chiefly guided in fixing their different winter-quarters; never remaining in those parts which they know with certainty produce but little moss, from the difference of their deer, and the few attempts made by them to remove the snow.'

F. In that part of the earth I should think they have but few plants.

Mrs. E. The frozen zone contains few species; but as, in the short career of the Polar summer, vegetation is very rapid, these comprehend a greater number of individuals than is commonly imagined. The verdure of that season is confined to the hills which are exposed to the south; and, though of short duration, it is sometimes very brilliant. Beside mosses and lichens, there are ferns, creeping plants, and

various bushes with berries—the resources and luxuries of Siberia and Lapland. No where else are the fruits more abundant, or possessed of a finer flavor. The frozen zone also admits of some trees, particularly the birch and willow; but they always remain dwarfs, never growing higher than one or two feet. But Lapland produces rye and leguminous plants, and would, it is said, have supported fine forests, had not an unwise economy procured their destruction.

F. Papa, what are lichens, which mamma mentioned a little while ago?

Mr. E. They are a very numerous race, which commonly grow in fleshy or leather-like patches, on the stems of trees, rocks, old buildings, palings, &c.; and of which those that grow like rough, yellow, and bluish crusts, upon the old gooseberry-bushes and apple-trees in the garden, are some of the most common species. They thrive in all kinds of soil, and in every climate. Many of them are useful in commencing the operations of nature in the growth of vegetables on the barest rocks, receiving no other support than what the air and rain afford them. As they decay, they are changed into a very fine mould, which nourishes other species; these, in their turn, become food for mosses, and they likewise rot; and, in course of time, a soil is formed from the refuse of the whole, capable of maintaining plants, and even trees. Several different kinds of lichen afford beautiful dyes; and one of them, called dyer's lichen,*

* Lichen rocella.

which communicates to silks and wool various shades of purple and crimson, is particularly valuable. This plant, which is brought chiefly from the Archipelago and the Canary Islands, is of great importance as an article of commerce; and, when scarce, has been sold for even five thousand dollars a ton!

E. Can you tell us something about sea-weed, papa? When we were last at Scarborough, I found *such* quantities, of different forms, and some very beautiful indeed!

Mr. E. Many things respecting these and similar plants, my dear, are exceedingly interesting. Their roots serve only to fasten them to the bottom; many of them float about in the water, without being attached to any solid body, and they imbibe all their nourishment through their surface. In the islands of Jura and Skye, the sea-mack* is often used as winter food for the cattle, which regularly go down to the shores, when the tide is out, to eat it; and even the deer come from the mountains to feed on it. The inhabitants of Gothland, in Sweden, boil it, mix it with meal, and use it as food for their hogs; in Scandinavia, the poor people thatch their cottages with it; and it assists the preparation of kelp, a kind of salt, and a principal ingredient in the manufacture of soap. If the leaves of this plant receive a wound while growing, abundance of young shoots are thrown out from the injured part; and even if a hole or rent be made in the middle of a leaf, a new one will

* Fucus vesiculosus.

spring from each side of it. In Scotland, the sea-tangle* and the dulse† are used as food; and of the stems of the former the handles of knives are sometimes made. For this purpose, a thick stem is chosen, and cut into pieces about four inches long; the hilts of the knives are stuck into these while fresh, and, as the stem dries, it contracts and hardens firmly around them, and, when tipped with metal, can scarcely be distinguished from horn. Another kind‡ is employed in China as glue and gum-arabic are with us; and with it large sheets of paper are coated, in order to make them transparent, and to prepare them for lanterns and windows, instead of glass. Windows are sometimes made of slips of bamboo, which are crossed, and the spaces between are filled up with thin sheets formed of a glue made by dissolving the plant in warm water, which stiffens as it cools. Another§ is highly esteemed as a luxury in the east. Of this, the swallows' nests I mentioned|| as edible are said to be made. Some of the larger kinds of sea-weed are truly wonderful, on account of their magnitude, and rapidity of their growth. One of them¶ is said to extend often to the length of a thousand or fifteen hundred feet; and it grows in such profusion, that the masses of it resemble islands.

Mrs. E. An immense belt of sea is frequently covered over with a vegetable production,** which sometimes appears in long ridges, with furrows

* Fucus digitatus. † Fucus palmatus. ‡ Fucus tenax. § Fucus lichenoides. || See 'Art in Nature,' page 247. ¶ Fucus giganteus. ** Fucus natans.

between, and sometimes in detached portions. To this particular part of the Atlantic, the Spaniards and Portuguese have given the name of 'the weedy sea.' A specimen of this vegetable is described to us as consisting of one long, fibrous stem, from which smaller lateral ones proceed. These were covered with strap-shaped leaves; and at the angle made by the leaves and stem were small pods, not quite so large as peas, on short foot-stalks, and generally two together. They contained no seeds, or other substance, and appeared to be merely air-vessels, to enable the plant to float on the surface. Several of them were encased in a beautiful coraline substance. About it were many of the little dwellers in the sea, and among them were shrimps, and a very pretty species of small crab, with a bright mottled tortoise-shell, and vivid green eyes. It is highly probable that this plant has no root, and is produced as it floats.

The sea of Japan also brings to the shores immense floating meadows of marine plants; so that the anxious mariner often apprehends that his vessel is entangled by a new land, seeming to rise up from the waters, which it conceals from view.

Mr. E. It is a remarkable fact that the lichens, or aerial algæ, never grow under water, while the fuci, or aquatic algæ, never grow out of water; and the same may be said of many other plants, some of which are, as it were, the living boundaries of land and sea. Thus the samphire * never grows but on the sea-shore, and

* Crithmum Maritimum.

yet is never found within reach of the waves, or rather, is never so near as to be wholly covered by the waters. A knowledge of this was on one occasion very consolatory. A vessel was driven on shore near Beachy Head, in 1821, and the whole of the crew were washed overboard. Four escaped from the wreck, but only as they thought to suffer a more lingering death; for, having in the darkness of the night been cast upon the breakers, they found when they had climbed up the highest of these low rocks, that the waves were rapidly advancing; and they doubted not that, when the tide attained its height, the whole range would be entirely covered with water. Unable to see anything beyond the spot on which they stood, and followed by the infuriated waves, which at length dashed upon them, the hope of life was quenched, and, in the agony of despair, they were debating whether they should not throw themselves on the mercy of the waters, when one of them, to hold himself more firmly to the rock, grasped a weed, which, even wet as it was, he well knew, as a flash of lightning afforded a momentary glance, was a sort of samphire, and he recollected that it never grows under water. That plant instantly became to these miserable men a messenger of mercy; and they felt assured that the voice of God would say to the waste of waters, 'Hitherto shalt thou come, but no further.' And so it was. In the morning they were seen from the cliffs, and conveyed safely to the shore. Thus an acquaintance with this single fact was to them of the greatest im-

portance. Who can tell, my dears, how valuable to you may be the information you now receive?

F. It is very valuable now, papa: we 'll try and learn something every day, and then how much we shall know by and by!

Mr. E. Everything in the natural world, my love, demands attention; but the more knowledge you acquire, the less will you seem to know. In the minute, as well as the vast, the footsteps of God may be perceived. We may just advert, at the close of the conversation, to the fungi, which are a very singular tribe. They have, properly, no leaves; their whole substance being fleshy, generally of quick growth and short duration, and of various degrees of firmness, from a watery pulp to a leathery or even woody texture. The only kind we venture to eat is the common mushroom,* which is often cultivated in hot-beds, and grows wild in parks and fields that have been long undisturbed by the plough. In September, a great variety of fungi flourish, of every size, shade, and hue, according to their species and situation, from the slender scarlet or yellow filament on some decaying stump, 'to the bold, broad agaric of a foot in height and diameter, standing in the forest as a fitting table for Oberon, the king of the fairies. No production of nature but is endowed with some portion of that beauty so lavishly diffused through creation; and these humble and despised vegetables, which the clown kicks away with his foot, will certainly appear to an attentive eye not destitute of their

* Agaricus Campestris.

share. In roaming the ancient wilds of Sherwood forest, in the autumn of 1827, says William Howitt, I was particularly struck with their varying character; some broad, tabular, and flaked with brown; some in the shade of trees of a pearly whiteness, others of a brilliant rose-color; some whose delicate surfaces were studded with dark embossments; some fashioned like a Chinese parasol; others gibbous and grotesque; the massy puff-ball, which before it becomes dry has been known to weigh several pounds; the pestilent-scented and ginger mushrooms, for all the world the exact resemblance of a Simnel-cake.' Cowper says,

> 'The common, overgrown with fern, and rough
> With prickly gorse, that, shapeless, and deformed,
> And dangerous to the touch, has yet its bloom,
> And decks itself with ornaments of gold,
> Yields no unpleasing ramble; there the turf
> Smells fresh, and rich, in odoriferous herbs,
> And fungous fruits of earth, regales the sense
> With luxury of unexpected sweets.'

Mrs. E. Mr. Knapp, too, has written beautifully on the same topic. 'No country,' he remarks, 'is, I believe, more favorable for the production of most of the agarics than Monmouth, with its deep dark woods, and alpine downs. Travellers tell us of the splendor of this race in the jungles of Madagascar, but nothing surely can exceed the beauty of some old copse in Monmouthshire, deep in the valley, calm, serene, shaded by the pensile, elegant, autumnal-tinted sprays of the birch; the ground enamelled with every colored agaric, from the deep scarlet to pallid white, the gentle grey, and sober brown,

and all their intermediate shadings.' But these fragile children of the earth are beauties of an hour.

> 'Transient as the morning dew,
> They glitter and exhale.'

F. But, mamma, if these plants only spring up and die, of what use can they be?

Mrs. E. Vegetation, my dear, is often exuberant; it is poured with unceasing prodigality from the lap of the earth, and returned thither, season by season, without being, in many instances, either provision for brute or human life; but never let us imagine, in this or any similar case, that *no* purpose is answered. It appears, indeed, to be an ordinance of nature, that all created things must have an end. This takes place by various means; slow and scarcely perceptible in some instances, but operative in all. Thus vegetating substances often effect the decomposition of plants and of trees. The dry-rot in wood, as it is called, is a decay occasioned by a peculiar vegetable of the fungus kind, which possesses the power of destroying the wood to which it adheres, and from which it derives its nourishment. It is originated and increased, like other vegetables, by seed. The seeds, which are extremely minute, are spread over the surface of the tree, or lodged in the cavities of its branches. They require, in order to make them vegetate, a suitable soil and situation: the former is wood rather damp, and the latter is stagnant air; and, wherever they have these, they readily spring and luxuriantly flourish. Thus these and other para-

sites carry on the work of dissolution; and we may fairly conclude that 'the constant renewal and decomposition of plants in all their curious and exquisite forms of blade and stalk, of leaf, flower, and seed—from the moss on the crag to the noble bread-fruit tree—has been preparing, through ages past, a soil in the desert, of which the produce, through ages to come, shall nourish a numerous and happy population, whose industry and wants, as they multiply on the earth, shall lead them alike to cultivate the deep declivities of the mountains, and clear the impervious fastnesses of the forests for food and for room to dwell in.'

Mr. E. I may now state what you will deem very extraordinary: vegetables pass through certain changes before they arrive at this state of putrefaction; and of these we avail ourselves for important purposes. The decomposition of vegetables is always attended by a violent internal motion, produced by the disunion of some particles and the combination of others; and this is called *fermentation;* and, as there are several periods at which this process stops, so means may be used to prevent it going forward, and to secure to us the new combination. The fermentations, to which water and a certain degree of heat are necessary, derive their names from their principal products. One is called *saccharine*, because its produce is sugar, and there is a resemblance to this process in the ripening of fruits, and in the first stage of vegetation. The seed, when buried in the earth, with a certain degree of moisture and of heat, absorbs water,

which causes it to expand, separates its particles, and produces sugar: the substance of the seed is thus softened, sweetened, and changed into a kind of white milky pulp, fit for the nourishment of the little plant.

F. And what is the next fermentation, papa?

Mr. E. It is the *vinous*, so called because the produce is wine. To this the saccharine fermentation is extremely favorable, if not absolutely essential; so that, if sugar be not formed during the life of the plant, the saccharine fermentation must be artificially produced before that which is vinous can take place. Thus barley does not yield sugar until it is made into malt; on this conversion taking place, it is prepared to yield what may be called the wine of grain, just as wine is the product of the fermentation of grapes or other fruits. The third fermentation is the *acetous*, so denominated because it changes wine into vinegar. A substance which has undergone a fermentation, will produce it in one that can pass through that process. Thus yeast, which is a product of the fermentation of beer, is used to excite and hasten the fermentation of malt, and also that of paste which is to be made into bread. This is usually classed among the acetous fermentations; when bread is good, the process only takes a single step, but when it goes beyond this, the bread is sour. The last is the *putrid* fermentation, by which organized bodies are reduced to their simplest elements.

E. How extraordinary, papa! But we, you know, have several things on the mantel-piece,

which look something like pieces of wood, and yet they are heavy as stones — what are they?

Mr. E. They are sometimes called petrified vegetables; but this is an error. If a vegetable is buried under water, or in wet earth, it will be slowly and gradually dissolved; and, as each successive particle is destroyed, it will be replaced by a particle of siliceous or flinty earth, conveyed thither by the water; and thus, in the course of time, the vegetable will appear as if it were changed to stone. It is so with animal as well as vegetable substances. Sometimes their entire dissolution is prevented, as when vegetables are buried in the sea or the earth, where the process cannot advance for want of air. They are then subject to a peculiar change, and become *bitumens;* as jet, which is hard and often used for ornaments; and coal, to which the animal and mineral kingdoms seem also to contribute. What changes take place! The celebrated Regent diamond which was set in the handle of the late Emperor Napoleon's sword of state, is now valued at $1,200,000, although it weighs but an ounce and an eighth, and was originally purchased for much less by Thomas Pitt, grandfather of the great Earl of Chatham, while governor of Madras. Yet this precious gem is no more than a piece of charcoal.

Fossil-wood, peat, and turf, are composed of woods and roots of shrubs which are partly dissolved by moisture under ground, and yet in some degree preserve their appearance. Heathy countries supply the latter abundantly; and thus fuel is provided for the poor.

Mrs. E. I will conclude the conversation with one suggestion; there are some respects in which there is a resemblance between our structure and that of vegetables — like us, too, they live and die; but between us there is still an immense space. Well may it be said:

'Am I but what I seem, mere flesh and blood,
A branching channel with a mazy flood?
The purple stream that through my vessels glides,
Dull and unconscious flows, like common tides;
The pipes, through which the circling juices stray,
Are not that thinking I, no more than they:
This frame, compacted with transcendent skill,
Of moving joints, obedient to my will;
Nursed from the fruitful glebe, like yonder tree,
Waxes and wastes—*I call it not mine, but me.*
New matter still the mouldering mass sustains;
The mansion changed, the tenant still remains;
And from the fleeting stream repaired by food,
Distinct as is the swimmer from the flood.'

Yes, 'there is a spirit in man, and the inspiration of the Almighty giveth him understanding.' This gift constitutes him the only being, through the whole range of the visible creation, who is able to contemplate the character and works of the Almighty and Supreme Artificer. The human soul is also immortal, and capable of eternal progression; and it should be with you and me, my dears, our great end, in this brief and chequered life, to prepare for that which is glorious and eternal.

THE WALK.

They had just gone through the green lane — passed by the pretty ivy-covered lodge — and crossed the stile conducting to the meadows — when Mr. Elwood quoted the remark to his children, that there would be more attentive observers of nature if the spider spun threads of gold, or if the lobster contained pearls. 'And yet,' he added, 'there is not a spot on the surface of the earth from whence valuable knowledge may not be derived — knowledge with which gold and pearls are not to be compared.

'What a noble fence is that, though far inferior to the one of which Evelyn so enthusiastically said, "Is there under heaven a more glorious and refreshing object of the kind than an impregnable hedge, of about four hundred feet in length, nine feet high, and five in diameter, which I can show in my now ruined gardens at Say's Court, at any time of the year — glittering with its armed and varnished leaves, the taller standards, at orderly distances, blushing with their natural coral!"

'Heaths, too, may be often observed in abundance: some present us with little wax-like flowers, others with pendent pearls: some are garnished with coralline beads, whilst others seem to mimic the golden trumpet, or tempting berries, or porcelain of bell or bottle shape: some remind us of Lilliputian trees, bedecked with Turkish turban in minature: some have their slender spray hung with globes like alabas-

ter, or flowers of the cowslip form: — nor are their colors less varied than their shape; whilst the foliage is equally beautiful in its apparent imitation of all the mountainous trees, from the Scottish fir to Lebanon's boasted cedar, through all the tribe of pine, spruce, larch, tamarisk, juniper, arbor vitæ, mournful cypress, and funeral yew.

'And how delightful are these meadows and pastures! Every single panicle bears many a distinct flower, each part of which is as perfect as the lovely rose, the splendid tulip, or the majestic lily. Food, clothing, conveyance from place to place, and a thousand other advantages, all depend on the produce of the fields.

'The grass of mountains is also remarkable. Frequently covered with mists, it remains green throughout the summer, resembling our lawns, and yielding delicious pasture for cattle when the meadows in the valleys and plains are burnt up. The matted roots of the grasses of the mountains of Switzerland and the Alps are extremely useful in preventing the surface of the soil from being washed down by rains; for the meshes of the net-work which they form confine the earth and retain it, as it were, in a basket, on the surface of the declivity. Were the sides of mountains to be tilled, it would endanger them: massive as they are, they are upheld by some of the smallest of the vegetable race. Remove the surface on which those grasses take root, and another is in peril, and thus one after another being washed down, the mighty mountain will disappear.'

E. Well, papa, I never heard that before. How wonderful! Little worms form islands; and the grass, the tender grass, sustains mountains!

Mr. E. It may surprise you, too, my dears, when I say, that the various kinds of corn belong to the family of the grasses. But mark their whole appearance; you know grasses or corn at first sight, by their blades, from all other plants that grow near them. They are distinguished by a simple straight, unbranched stalk, hollow and jointed, commonly called a straw, with long, narrow, tapering leaves, placed at each knob or joint of it, and sheathing or enclosing it, as if by way of support; their ears or heads consist of husks, each generally composed of two valves, which form the calyx or cup, and within this what may be termed the blossom, which is also a husk of two valves, dry and shining. These minute flowers are also furnished with a honey-cup. Each seed is enclosed either by the blossom or calyx. As they become ripe the husks open, and, if not timely gathered, the seeds fall to the ground, which is one of the many means used for the increase of vegetables. And how dreary would this earth be were it destitute of its verdant covering — so soft to the feet, and so refreshing to the eye! Still it is the prey of almost every animal that roams over it — beasts, birds, and insects banquet here with delight; but such is the wisdom and beneficence of Providence, that the more the leaves are cropped the faster do the roots increase; and, what is still more wonderful, the animals that browse on

grasses, though left at full liberty in the pasture, leave the straws which support the flower and the seed untouched; and those species which flourish on the tops of mountains, where the summer heats are not sufficient to bring their seeds to perfection, are generally increased by the root, or winter-buds, and do not depend on the seed for increase. A multitude of similar instances might be mentioned.

F. I remember, papa, you told me once of the care which is taken of a pea. I should like you to describe it again, and then Emma will hear it too.

Mr. E. The corolla is formed of four petals; the first is broad and large, covering the others as a defence and shelter from the injuries of the weather: it is called the standard or banner, and it is inserted deeply on each side, that it may not easily be driven out of its place by the wind. The side-petals, or wings, protect the sides of the flower; and, when these are taken off, you see the keel, which is so called because it is something like the bottom of a boat, which encloses and preserves the centre of the flower from harm, and is most curiously and delicately constructed. If, too, you compare the pod of a pea and that of a stock, you will see that the foot-stalk, which supports the flower, is slender, and easily moved about by the wind; but, in wet and stormy weather, the pea turns its back to the storm, whilst the banner enfolds the wings, by closing about them, and partly covers them. The same office is performed by the keel, containing the essential parts of the fructification: thus is this flower cu-

riously protected from the rain and wind; and, when fair weather returns, it changes its position, as if sensible of the alteration, expands its wings, and erects its standard as before. The means employed, for the preservation of plants are wonderful indeed; but there is especial security for those which nourish men and animals.

E. I am glad, papa, Frederic thought of the pea, and you are very kind to describe it again; but you were going to mention, I think, something else.

Mr. E. The corn, or grain-bearing plants are styled the cerealia, from Ceres, the goddess of corn. That one, however, on which any people chiefly depend for their food is called *corn* by them; as *wheat* is in England, *oats* in the northern lowlands of Scotland, *rye* in the sandy districts on the southern shores of the Baltic sea, and *maize* throughout the United States of America. They are all annuals, both in their stems and roots, the whole plant dying after the seed has been completely formed and ripened, and sometimes even before the latter process has fully taken place. All send up a hollow straw, or culm, which is divided into lengths by nodes or joints; at these joints the leaves have their insertion, one at each joint on the alternate sides of the stem; and each leaf embraces the stem for some length in the manner of a sheath. These stems, moreover, always contain a portion of silex, or earth of flint; and hence their ashes are useful in polishing articles formed of wood, horn, ivory, and some of the softer metals;

while its presence, and the difficulty of separating it from what is purely vegetable, has prevented the use of straw in the manufacture of paper. The last leaf of the season becomes a sheath to the newly-formed flower, embracing it for a time so firmly that the sheath cannot be opened without difficulty. With the growth of the flower it bursts open its sheath, rises above it, and the leaf then turns backward. The head, or ear, consists of an uncertain number of flowers, followed by seeds. These are sometimes placed on a single rib or rachis, as in wheat and barley, and they then form a spike. In what is called Egyptian wheat this spike is compound, there being more than one rachis: if this consists of branches that are naked at their points of junction, and have spikelets at their extremities, they form what is called a panicle: this is the case, for example, with oats. A full-grown and perfect grain of wheat is in form a compressed oval, and is enclosed first in certain chaffy sides, which are easily separated, and then in a membraneous tunic or covering, which invests the seed much more closely. On one side of the grain a groove may be observed; and at the base, on the opposite side, there is a small protuberant oval space, which shows the germ or embryo of the future plant, and which is at this time covered by the tunics. The vessels whereby the grain was attached to the plant, and through which it drew nourishment until its maturity, had their point of attachment at the lowest end of this protuberance. When the seed is perfectly ripe, these vessels separate, the point

of separation speedily heals, the grain may then be easily threshed out from the chaff in which it had lain buried, and sometimes it sheds itself spontaneously.

E. Oh, dear, dear, papa! — what a little wonder is a grain of wheat! Now I shall look out for the groove and the little protuberance; and then you know one grain produces an ear, and that will yield a great many.

Mr. E. It will, my dear; the corculum, 'little heart,' or germ, contains a principle, which, if rightly managed, can produce, not only a plant of wheat, but plant after plant, until, in the course of a few harvests, its progeny would become capable of feeding a nation. Thus, notwithstanding the ravages of war, the vital principle of vegetation, destined for the chief support of the human race, has not been lost, but it has remained to man, like fire, which he alone has subjected to his use, to be called forth at his bidding, and to contribute to his support, comfort, and prosperity. One circumstance connected with the increase of the cereal grains is very singular. An insect * deposits its eggs in the very core of the primary shoot of the wheat, so that it is completely destroyed by the larvæ or grubs; and did not the plant possess within itself the means of repairing the injury, the care and toil of the husbandman would be lost. But happening, as it does, in the spring, shoots immediately grow forth from the knots, the plant becomes more firmly rooted, and produces, probably a

* Musca pumilionis.

dozen stems and ears, where, but for the temporary mischief, it might have yielded only one. The inherent power of multiplication possessed by vegetables is indeed most extraordinary. In 1660, Sir Kenelm Digby asserted 'that there was in the possession of the Fathers of the Christian doctrine at Paris, a plant of barley which they kept at that time as a curiosity, and which consisted of two hundred and forty-nine stalks springing from one root or grain, and in which they counted above eighteen thousand grains, or seeds of barley. On the 2d of June, 1766, Mr. Miller, of Cambridge sowed some grains of the common red wheat, and, on the 8th of August, a single plant was taken up, and divided into eighteen parts, and each part planted separately. A second division produced sixty-seven plants, and a third amounted to five hundred. They were then divided no farther; and some of them produced upwards of one hundred ears from a single root, many of which measured seven inches in length, and contained between sixty and seventy grains. The whole number of ears which, by this process, were produced from one grain of wheat, was twenty-one thousand one hundred and nine; which yielded three pecks and three quarters of clear corn; the weight of which was forty-seven pounds, seven ounces; and the whole number of grains was about five hundred and seventy-six thousand, eight hundred and forty! In this case, there was only one general division of the plants made in the spring; had a second taken place, Mr. Miller thinks the number of plants would have amounted to two thousand!

And now should you like to hear some facts as to the history of wheat?

E. Exceedingly, papa, exceedingly!

Mr. E. In the early books of Scripture, we often read of corn, and of Ruth gleaning with the maidens of Boaz, 'unto the end of barley-harvest, and of wheat-harvest.' Pliny says, that in the champaigne country about Byzacium in Africa, wheat had been known to yield a hundred and fifty fold. He mentions that a procurator-general of that province, under Augustus Cæsar, sent the emperor from thence a plant of wheat which had nearly four hundred straws springing from one grain, and meeting in one and the same root. Sicily is said to be the first country in Europe where grain was cultivated. Ceres was not only worshipped in that island, but is often represented on the ancient Sicilian coins; and garlands of ears were offered to her before they began to reap. At what period wheat was first cultivated in England is only matter of conjecture. Cæsar found corn growing on the coast, but of what kind we are not informed. Other seeds are dispersed through the earth by winds and currents, in the hairy coats of quadrupeds, and in the maws of birds. But the corn-plants are said, in common with many other important vegetable productions, to follow the course of man alone. Even hostile armies have been instruments of their diffusion. Cortez, the inhuman conqueror of Mexico, wrote from thence to the King of Spain, 'I beseech your Majesty to give orders that no vessel sail for this country without a certain quantity of plants and grain.' The

foundation of the wheat-harvests of that country is said to have been three or four grains, which a slave of the conqueror discovered accidentally in 1530, mixed with a quantity of rice. These he carefully preserved, and used so advantageously as to entitle him to public gratitude; but even his name is unknown; while the Spanish lady, Maria d'Escobar, who first imported the same blessing into Peru, has her name, and her distribution of the produce of successive harvests as seed among the farmers, celebrated in history. A chief, named Duaterra, was the first person who actually reared a crop of wheat in New Zealand. On leaving Port Jackson the second time, to return home, he took with him a quantity of it, and much surprised his acquaintances by informing them that this was the very substance of which the Europeans made biscuit, such as they had seen and eaten on board their ships. He gave a portion of it to several persons, all of whom put it into the ground, and it grew well; but, before it was well ripe, many of them were impatient for the produce; and, as they expected to find the grain at the roots of the stems, similar to their potatoes, they examined them, and, finding no wheat under the ground, all, except one, pulled it up, and burned it. The chiefs ridiculed Duaterra about the wheat; and all he urged would not convince them that wheat would make bread. His own crops, and that of his uncle, who had allowed the grain to remain, came, in time, to perfection, and were reaped and threshed; and, though the natives were much astonished to find that the grain was produced at the top and not

at the bottom of the stem, yet still they could not be persuaded that bread could be made of it. A friend afterwards sent Duaterra a steel mill to grind his wheat, which he received with no little joy. He soon set to work before his countrymen, ground some wheat, and they danced and shouted with delight when they saw the meal. He afterwards made a cake, and baked it in a frying-pan, and gave it to the people to eat, which fully satisfied them of the truth of his assertions. The chiefs now begged more seed, which they sowed; and such of it as was attended to grew up as strong a crop as could be desired.

F. Will wheat grow any where, papa?

Mr. E. Ancient and modern writers affirm that it will grow with cultivation in almost every part of the world. It is found to flourish, not only in our temperate clime, but also in the extremes of heat and cold. In Lapland, it is cultivated as far as sixty-eight or seventy degrees north latitude; and Humboldt found, in the vicinity of La Vittoria, at the moderate elevation of two hundred and seventy-three toises above the level of the ocean, some fields of wheat, mingled with plantations of coffee, plantains, and sugar-canes. Thus, as it is the plant most necessary to mankind, so it is the most general; and it ought not to be overlooked, that its presence in any region of the earth attests that man is there in an advanced state of civilization. In the sepulchres of the Egyptian kings, which were opened by the scientific men who accompanied the French army into Egypt, the common wheat was found in vessels so perfectly closed that the grains re-

tained their form and color; and thus, buried, as it had been, for several thousand years, it shows as clearly the civilization of that country as its temples now in ruins: because the corn-plants, such as they appear under cultivation, do not grow wild in any part of the earth. Emma, do you recollect anything besides bread made from wheat?

E. I think not, papa: — but, let me see! — oh, I remember now reading something about starch.

Mr. E. To that I referred, my dear. We are indebted, for its invention, to the island of Chios. Starch-flour was called Amylum by the Greeks, because it was made without going into a mill, or being ground on stones. The next in esteem with the ancients was that of Candia and Egypt; where it was procured by simply putting the wheat in a wooden vessel, and covering it with fresh water, which was changed five times a day: it was then made into a kind of paste, and afterwards laid to dry, either on linen cloths, or in wicker baskets; and finally, it was put on tiles, and placed in the sun to harden. Besides starch, however, wheat contains gluten, which is of a grey color, is very viscid, or sticky, and makes it the most nourishing of all grain; and mucilage, which is a gummy substance.

E. Now, papa, as we have called to see Mrs. and Miss Robinson, and you have rested yourself, and Frederick has admired the new microscope, and I have been delighted with it too, and have borrowed this pretty drawing which I

wish to copy — how delightful it will be if you can tell us more about the corn-plants as we return home!

Mr. E. Well, then, my curious little girl, we must think of barley, which the Egyptians suppose was the first used for the sustenance of man. They affirm that the mode of cultivating it was imparted to their ancestors by the goddess Isis, who, having discovered the plant growing wild in the woods, taught men how to rear it, so as at once to increase the quantity, and improve the quality of its produce. A chief of the Susquehannah Indians related to Dr. Franklin a similar tale — 'In the beginning,' said he, 'our fathers had only the flesh of animals to subsist on; and, if their hunting was unsuccessful, they were starving. Two of our young hunters having killed a deer, made a fire in the woods to broil some part of it. When they were about to satisfy their hunger, they beheld a beautiful young woman descend from the clouds, and seat herself on that hill which you see yonder among the blue mountains. They said to each other, 'It is a spirit, that perhaps has smelt our broiling venison, and wishes to eat of it: let us offer some to her.' They presented her with the tongue; she was pleased with the taste of it, and said, 'Your kindness shall be rewarded. Come to this place after thirteen moons, and you shall find something that shall be of great benefit in nourishing you and your children to the latest generation.' They did so; and, to their great surprise, found plants, they had never seen before, but which, from that ancient

time, have been constantly cultivated among us to our great advantage. Where her right hand had touched the ground, they found maize; where her left hand had touched it, they found kidney-beans; and, where she had seated herself, they found tobacco.' Thus the uninstructed are fond of the marvellous and supernatural, and fictions supply the place of facts.

F. Where, papa, was barley first grown?

Mr. E. That I cannot tell you, my dear. In some respects, it has the advantage of wheat. It may be propagated over a wider range of climate, bearing heat and drought better, and coming so quickly to maturity, that the short northern summers, which do not allow of the ripening of wheat, are yet long enough for the perfection of barley. It is the latest sown, and the earliest reaped, of all the summer grains. In warm countries, such as Spain, the farmers can gather two harvests of barley within the year. Linnæus relates, in his tour in Lulean Lapland, that the whole process of its production occupied not longer than six weeks. When the bark of the grain is removed, it is called Scotch or pearl barley. The ancients used to make it, in its raw state, food for horses, as the Spaniards do to the present day. And I remember a curious fact, which shows the effect of habit. A man of property was taken by pirates, carried, with the other passengers, and the crew of a vessel, to Algiers, where he was condemned to work as a slave. Every morning he received, on going out to work, in common with the captives, some barley, of which he took a few grains

now and then, as he had opportunity. After several years of bondage he obtained his freedom, but he could not thenceforward take a regular meal; he could only eat occasionally, and then but little at a time, as he did in the days of his captivity.

F. For what else, papa, is barley used?

Mr. E. It is a curious fact, in the history of man, that almost all nations, from the earliest antiquity, have had some method of producing intoxication; and barley was employed for this purpose in times far distant. It is said to have been the natural substitute for wine in the countries which could not produce the grape, and to have been originally made in Egypt, where the art of brewing this fermented barley-liquor was confidently attributed to Osiris, the Bacchus of the people. From Egypt, this liquor passed to the west, through Galatia, and various countries that were too cold for vines; and, even where they could be cultivated, the process of making intoxicating liquor from corn was much more rapid than the cultivation of them. Every migrating race, passing into a colder climate, would, therefore, naturally cherish this invention; thus the knowledge of this liquor spread over all the countries of Europe under various appellations, all of which literally denoted, at first, 'the strong water.' In England, it is mentioned as early as the laws of Ina, king of Wessex. It was the favorite liquor of the Anglo-Saxons and Danes, as it had been of their ancestors, the Germans. Amongst the liquors provided for a royal banquet, in the reign of Edward

the Confessor, ale is particularly mentioned. The monasteries, from early periods, had always breweries, and good cellars, inclosed in their precincts; and that called 'conventual ale' was always the strongest and the best. But it was not till 1524 that hops were first brought to England; and about the reign of James I. they became generally used. It is about three hundred years since ale was first made in England as it is made now; and in 1830, there were 46,727 acres occupied in the cultivation of hops in Great Britain. The extent to which porter-brewing is carried, in London, may be conceived from the account we have of a vat, in the brewery of Messrs. Meux & Co., whose circumference was nearly a hundred feet, its height was about twenty-two feet, and it contained three thousand five hundred and fifty-six barrels, or one hundred and twenty-eight thousand and sixteen gallons! The great brewers have given entertainments in their immense vats to distinguished persons, who have been greatly amused by the circumstance.

E. Oh, papa, how funny they must look! The people seem very little from a high place, such as the gallery of St. Paul's; but then, you know, these are not so far down. What a quantity must be made by all the brewers!

Mr. E. It is indeed immense. I have mentioned to you the saccharine fermentation of seeds; and this is artificially produced, to make malt. For this purpose, a quantity of barley is soaked in water for two or three days; the water being afterwards drained off, the grain

heats spontaneously, swells, bursts, sweetens, shows a disposition to germinate, and actually sprouts to the length of an inch; when it is put into a kiln, by which the process is stopped, and the grain is well dried at a gentle heat. In this state it is malt, the principal ingredient of beer. About thirty million bushels of barley are annually converted into malt in Great Britain; and more than eight million barrels of beer — of which four-fifths are strong beer — are brewed yearly! But I think there will be time, before we reach home, to notice some facts respecting oats, which grows on soils and in situations where neither barley nor wheat can be raised, and which is the hardiest of all the cereal grains cultivated in Great Britain.

E. And, papa, oats are not like the other plants.

Mr. E. They are not, my dear. The ear of oats is not a spike with a single rachis, but a panicle, resembling in some degree the stem and branches of a pine. While young and light, these branches arrange themselves round the centre of the stem; but as they advance towards maturity, and acquire weight, they generally bend over on one side. And why do you think this is? That thus the air and light may visit, and the rain may wash each individual grain; so that any lodgement of the larvæ or grubs of insects, or the seeds of parasitical or destructive plants, is thereby prevented. Still further, the grains being pendent, and having the open extremities of their chaff towards the earth, are effectually defended from the lodgement of rain

within, an advantage which neither wheat nor barley possesses, and hence are liable to diseases from which oats are exempted. Their nutritive quality, however, is smaller, in a given weight, than that of any other cereal grains; but they are well adapted as food for horses and poultry. Oatmeal, prepared in various ways, is used very generally in Scotland; and cakes made of it are thought by many to be very agreeable. Formerly it was more commonly used. In the household book of Sir Edward Coke, in 1595, there are constant entries of oatmeal for the use of the house, besides 'otmell to make the poore folkes porage.' And, about fifty years ago, so small was the quantity of wheat used in the county of Cumberland, that it was only a rich family that used a peck of wheat in the course of a year, and that was at Christmas. The usual treat for a stranger was a thick oat-cake and butter. At the time of the Revolution, 14,000,000 bushels of wheat are said to have been grown in England; but it is stated that the annual consumption of wheat in the United Kingdom now, is estimated at 13,000,000 quarters, and that of other grain at 36,000,000 quarters; making together 48,000,000, of which not one twentieth part has during any year been imported, and in general a far less proportionate quantity. The daily consumption of wheat in the United Kingdom may be taken at 35,000, and of all other grain at 108,000 quarters a day. Each person consumes about seven bushels annually.

E. Now, papa, you look as if you were going

to stop; but we have not reached the long green lane yet. Frederick seems too as if he should like to hear a little more; and, as for me, I'm never, *never* tired.

Mr. E. It is remarkable that the vital principles of some vegetables will lie dormant for years, and even ages. Seeds have been made to grow in this country after being buried at Herculaneum for more than seventeen centuries; but which, having been so long deprived of air had been kept from vegetating. Without this element, they, like ourselves, cannot exist. It is also worthy of observation, that the agriculturist pays attention to the improvement of the soil, lest his crops should be lessened. The Celts improved their land, when it was stiff and clayey, by burning the natural produce of the soil before they ploughed it; and our 'fallowing,' by which the land is allowed a year's rest occasionally, and during that time is repeatedly turned over by the plough, exposes every part to the atmosphere, whence it absorbs oxygen; and, the weeds being buried in the process, the land is greatly enriched. Two sorts of grain, moreover, cannot be raised in succession without the latter degenerating; while some plants succeeding a crop of grain are improved by it.

F. How does that happen, papa?

Mr. E. M. de Candolle supposes it to be as follows: A plant being under the necessity of absorbing whatever comes to its roots, sucks up some particles not adapted to its nourishment; and, in consequence, — after having manufactured the sap in its leaves, and sent it downwards

through all its organs, each of which receives the nourishment it requires, and made, in fact, as much of it as possible, — it has a residue of what is not adapted to its support: these particles are therefore given out unaltered by the roots, and thus deteriorate the soil for a following crop of the same species of plant, but improve it for one of another family. What a benevolent provision is this! We have had several others resembling it in the present conversation.

In the Vale of Glastonbury, it is said, there is land where wheat has grown for many years together without any manure; and in the neighborhood of the Carron iron-works, in Scotland, wheat has been raised above thirty years, without injury either to the crops or the soil; but, in these instances, the soil must not only abound with vegetable nourishment, but be particularly adapted to growing wheat; consequently, the roots would have little or nothing to reject, and successive crops of the same grain might be raised so long as the land was not exhausted. M. de Candolle's opinion seems just, but it requires the support of facts. It is true, nature does not raise plants of different families in succession, but she does what is equal in effect. She raises such a prodigious variety of trees and shrubs in her spontaneous forests, and in her meadows such a multiplicity of herbs and grasses, that the different plants mutually supply each other with what they give forth; and then the whole plant, whether grass, shrub, or tree, returns to the soil, to repay the nourishment it had previously received.

E. I see, papa, we may learn something every where, if we please. Shall we go over the little bridge, and pass by the mill?

Mr. E. Yes; that way is preferable. In the East, grain was commonly reduced to meal by a mill; not like *that* on the right, which is worked by water, but which went by hand. It consisted of the lower mill-stone, the upper side of which was concave, and the upper mill-stone, the lower side of which was convex. The hole for receiving the flower was in the centre of the upper mill-stone; and, when corn was ground, the lower one was fixed, and the upper was made to move round it, by means of a handle, with considerable velocity. Dr. Clarke says, 'In the island of Cyprus, I observed upon the ground the sort of stones used for grinding corn, called querns in Scotland, common also in Lapland, and in all parts of Palestine. These are the primeval mills of the world, and they are still found in all corn countries where rude and ancient customs have not been liable to those changes introduced by refinement. The employment of grinding with these mills is confined solely to females; and the practice illustrates the prophetic declaration of the Saviour concerning the day of Jerusalem's destruction: 'Two women shall be grinding at the mill: one shall be taken and the other left.'

F. We should know then, papa, how they manage in the East, if we would understand the Bible.

Mr. E. We should, my dear. Without an acquaintance with Oriental manners and customs, much will be obscure which would otherwise be plain. I hope, however, you will be increasing-

ly interested with the study on which we have entered. How various are the changes of matter! Out of the rude materials of the seeds, and roots, and leaves of plants, spring many forms of strength and beauty; and by them and animal food the human frame itself is built up. Yes! by these the little babe is sustained, so that it may pass through the days of childhood and youth and at length become the man in all the energy of his power, or the woman in all her tenderness and grace; and by these the eye is preserved in all its brightness, and the lip to pour forth its eloquence, and the ear to receive instruction, and the hand to display its cunning, and the brain — that instrument of mind, of soul — by which man is prepared to advance his own interest and that of others and to engage in the service of Him who is the 'Great Source of Being.'

E. Astonishing, astonishing! But I see some one coming whom we all love. There is Edward on the little grey pony! Look, how happy he seems! — and then how great he appears! And here is dear, dear mamma. — Oh, I have such wonderful things to tell you — about wheat, and barley, and oats!

Mrs. E. I am glad you have been so much interested, my love, and Frederick looks as pleased as yourself; so when you have related what you can recollect, perhaps I may tell you of some other things, almost or quite as amazing. Frederick, dear, open the gate; your walk has been very long, though papa, I know, has made it very delightful.

THE PROMISE.

'I HAVE not forgotten the promise you gave us, dear mamma,' said Emma; 'what wonderful things did you mean? I hope the time will soon come when you will be able to tell us.'

'One of those to which I referred,' said Mrs. Elwood, 'is a slender plant, that seldom exceeds two feet and a half in height, and which is scarcely superior in appearance to the common grass; yet this it is which yields many of our garments; to it our sex, Emma, is indebted for much that is ornamental; it is the medium of many of the pleasures and advantages of friendship; and, without it, this island might have remained unknown and unpeopled.'

'A plant, did you say, dear mamma?' asked Emma.

'I did, my love,' replied her mother; 'and that plant is flax; from whose fibres we procure the comfort of linen, and the beauty of lace; these also yield paper for our letters and books, and of them sails were first made for our vessels, with which the ocean is traversed, commerce extended to the ends of the earth, and our isle enriched with the most useful roots, luxurious fruits, and ornamental plants.'

At this statement, Emma acknowledged that her curiosity was still more excited; and, after having obtained permission to ask her father to join them, if sufficiently disengaged, and secured his acquiescence, she inquired where flax was first used.

Mrs. E. Some have supposed that linen-cloth was made previous to the deluge, because we read that Noah slept in a tent; but Egypt, which is called the land of Ham, soon became the garden of the East, and the seat of arts. Isis, the wife of his son Misraim, is said to have taught the art of agriculture, and employed herself diligently in cultivating the earth, for which she was deified, and the worship of Isis became universal in Egypt. Her priests were clothed in *linen* garments. The eastern kings and princes were also attired in linen; flax, therefore, formed a considerable branch of the trade of Egypt; and the method of making fine linen was carried to such perfection that the threads which were drawn out of it were almost imperceptible to the keenest eye. Pliny states, that some of the thread made from flax was finer, and more even, if possible, than the web of a spider, and yet so strong that it would give a sound nearly as loud as a lute-string. He says, too, that he had seen an Egyptian net made of so minute a thread that notwithstanding every cord in the mesh was made of a hundred and fifty threads twisted, yet it could be drawn through the ring of a finger; but that the most extraordinary net-work was that shown in the temple of Minerva, in the isle of Rhodes, every thread of which was twisted three hundred and sixty-five times double, according to the days in a year. This curious piece of workmanship had formerly belonged to Amasis, who, from a common soldier, became King of Egypt, about five centuries before the Christian era. The Greeks made a linen of so fine a fabric, from

the flax which they cultivated at Belvedere, that it sold by weight at the price of gold. But what should you think, Frederick, of cloth that could not be consumed in the fire?

F. Oh, mamma, that would be strange! I should have thought it would burn very quickly; and Emma whispers, 'So should I, I'm sure!'

Mrs. E. Pliny describes it as 'living flax,' and says he saw, at a great feast, all the table-cloths, napkins, and towels thrown into the fire, which received a cleanness and lustre from the flames which no water could have given. This cloth was used at royal funerals to wrap round the corpse as a shroud or sheet, in order to preserve the ashes of the body from mixing with those of the funeral pile, on which it was consumed. He adds, that the flax of which it was made grew in the deserts of India, where the country is parched and burnt with the sun — that it is difficult to be found, and hard to be woven, from the shortness of the fibres.

E. Has any one had it since that time, mamma?

Mrs. E. The art of making this cloth is nearly lost, although John Baptist Porta, the inventer of an optical instrument called the camera obscura, says that in his time, some three or four hundred years ago, the spinning of asbestos, * for this is the substance presumed to be intended by Pliny, was a thing known to every body at Venice; and, it is said, still to be used by the princes of Tartary, in burning their dead. A

* A beautiful mineral of a fibrous appearance.

handkerchief, made of this substance, was long since presented to the Royal Society of London. The asbestos is still found in the isle of Anglesey, in Aberdeenshire, in some parts of France, and in several other places. Papa, I dare say, will now kindly tell you of some purposes, not yet mentioned, to which flaxen linen was applied.

Mr. E. I will assist you very cheerfully, my dear, in this pleasing task. It was used at a very early period for the stupendous temples of the heathen, and for the courts of their palaces, which were open buildings, surrounded with massive columns; and, as the art of weaving became known, these gorgeous edifices were occasionally hung with rich curtains of linen cloth, to shade or protect the guests from the sun or weather. At the conclusion of the grand festival given by Ahasuerus, as described in the book of Esther, he feasted all the people that were in Shushan, in the court of the garden of the king's palace, where were white, green, and blue hangings, fastened with cords of fine linen and purple to silver rings, and pillars of marble. Julius Cæsar caused the Forum, at Rome, to be covered with fine curtains, as also the whole of the principal street, called Sacra, from his own dwelling to the cliff of the capitol. And Nero ordered the amphitheatre to be adorned with curtains of a sky-blue, spangled with stars. Spain was celebrated for her manufacture of linen as early as the birth of Christ; and, subsequently, it was made in France Holland, and Germany. The people of the last-mentioned country carried on the spinning and weaving of linen in vaults and caves under

ground. The fine muslins of India were also made by persons thus entombed, who were never allowed to see the light. Even children were imprisoned from their infancy in these dark abodes, in order to produce a finer thread than it was thought could be drawn by the eye which was blessed with the light of day.

E. Oh, dear papa, I hope they are not so cruel now!

Mr. E. They are not, my dear; the art of weaving then practised is happily lost; and none can wish its revival. The first person who wore a linen shirt was the Emperor Alexander Severus, who was murdered A. D. 235; but the general use of such a garment did uot take place till long after that period. The making of linen cloth was probably introduced by the Romans, who certainly cultivated flax in this country. Before Britain had attained its present eminence, each town or village had its weaver: the daughters of farmers were early instructed in this art: their female domestics filled up all their vacant hours at the distaff or wheel; and every good mother was expected to supply her family with linen of her own spinning. A friend of mine, in a recent visit to Scotland, saw a singular specimen of ingenuity — a man's shirt wrought in a loom, about a hundred years ago, by a weaver in Dunfermline, named Inglis: it has no seam; and every thing was completed without aid from the needle, excepting a button for the neck.

E. Oh, mamma, I should like to see that! He must have been very clever! Do you remember any other use which has been made of flax?

Mrs. E. The flax of New Zealand has, of late, attracted great attention, both in this country and in other parts of Europe. From it the natives fabricate not only their fishing-lines and nets, and such other cordage as they require, but also the cloaks or mats which form their clothing. It is of a silky fineness, and superior to anything we possess. It springs up from the earth in bunches or tufts, with sedge-like leaves, and bearing, on a long stalk, pale yellow flowers, which give place to long roundish pods, filled with very thin, shining, black seeds. In France, some of this species has been cultivated in the open air with great success. It grew to the height of more than seven feet, the stalks being above three inches in circumference at the base, and tapering towards the top. On one stalk, there were a hundred and nine flowers, of a greenish yellow color, and some very strong ropes were made from the leaves, whence flax was obtained by a simple process.

F. And do you know how they prepare the flax in New Zealand?

Mrs. E. After having cut it down, and brought it home green in bundles, the natives scrape it with a large muscle-shell, and take the heart out of it, splitting it with the nails of their thumbs, which, for that purpose, they keep very long. But it would seem that they have latterly made instruments for dressing the flax, not very unlike those of our own wool-combers. The outside they throw away, and the rest they spread out for several days in the sun to dry, which makes it as white as snow. They spin it in a double

thread, with the hand on the thigh, and then work it into mats, also by the hand; three women may work at a mat at one time. Mr. Nicholas saw the wife of a chief, on one occasion, employed in weaving. The mat on which she was engaged was of open texture; and she performed her work with wooden pegs stuck in the ground at equal distances from each other, to which, having tied the threads that formed the woof, she took six threads with the two composing the warp, knotting them carefully together. It was astonishing, he says, with what dexterity and quickness she handled the threads, and how well executed was her performance. He was assured that another mat which he saw, woven with elaborate ingenuity and elegance, could not have been manfactured in less time than between two and three years.

At Cambray, a city of France, the beautiful linen called cambric was first manufactured; and, for many years, England spent in its purchase not less than $1,000,000 per annum. From this vegetable, too, the lace of Brussels, Valenciennes, Lisle, Mechlin, Normandy, &c., has been obtained. The seeds supply birds with food, and yield an oil which is useful as a medicine, and is also employed by artists. The cakes, made of the husks after the oil is squeezed out, are used to fatten cattle; the dust is an excellent manure; and, indeed, the purposes to which flax is applied are too various to enumerate.

E. Thank you, dear mamma; I should never have thought of hearing so much, and so much

that is curious too, about the little plant called flax; but you know that is only *one* wonderful thing, and, therefore, I am in great hopes that others are to come.

Mrs. E. Another I will mention is hemp. The Phœnicians, so famous for their achievements in navigation, are thought to have first discovered its use in forming cables and tackle for their ships. Isaiah spoke of them when he mentioned 'the merchant city, the mart of nations, whose merchants are princes, and whose traffickers are the honorable of the earth.' Pliny states that the hemp which was found in some parts of Italy, and near Rosea, in the Sabines' country, grew as high as shrubs, and even in the woods, without the labor of sowing. The Romans gathered the seed before the stalks; when ripe in the autumn it was rubbed out and dried in the sun, the wind, or in smoke; and the stalks were not plucked out of the earth till after the vintage. It was then the work of the husbandman to peel and cleanse it, and separate carefully the best from the worst. To Britons this plant is of great importance, as it forms the sails and tackle of our vessels, from the huge cable of the Asia, which you saw after it came from Navarino, to the net of the fisherman, which you have noticed when on the northern or the southern coast.

F. What a quantity of hemp, papa, must be required for a man-of-war!

Mr. E. The sails and cordage of a first-rate require 180,000 pounds of rough hemp for their construction; five acres of land are required to

produce a ton of hemp; thus, such a vessel consumes a year's produce of 424 acres of land.

F. I am quite astonished! Can you tell me, papa, how a rope is made?

Mr. E. It is a singular process; the first business is hatchelling the hemp, or combing out the short fibres, and placing the long ones parallel to each other. Then the hemp is spun into yarns; and here, it must be remembered, as well as throughout the making of the cable, the various fibres of the hemp should bear an *equal* strain, which it is difficult to secure, because the twisting deranges the parallel position of the fibres. Each fibre, as it is twisted, ties the others together, so as to form a continued line, and it bears, at the same time, a certain portion of the strain; and so does each alternately. Next, the yarns are to be made. Warping them is stretching them to a certain length; and for the same reason that so much attention is paid to arranging the fibres for the yarns, great care must be taken in managing the yarns for the strands, which are then to be formed. The hardening, by twisting, is also an essential part of the process, for, without this, the rope would be little better than parallel fibres of hemp; and each yarn, and each strand, as it is twisted or hardened, is so arranged that, when drawn into the cable, all the parts may, as nearly as possible, resist the strain in an equal degree. When we conversed some time ago on 'Mechanics,'* I said that the tendons of the hu-

* See 'Art in Nature,' p. 10.

man body were better made than the best cables; and now I can show you this more fully. A tendon consists of a strong cord, apparently fibrous, but which may be separated into lesser cords; and these can be shown to consist of cellular membrane, which gives firmness to all the textures of the human frame. In addition to this, the cords of which the larger tendon consists do not lie parallel to each other, nor are they simply twisted like the strands of a rope; on the contrary, they are most admirably plaited or interwoven together, in a way which could not be imitated in cordage by the turning of a wheel. In a rope the strands cannot resist the strain equally, but the tendon can. Patent cables have been produced more nearly resembling the animal structure than others; but the tendon has still its superiority, because its artificer is God!

F. Papa, I remember many cases you have mentioned, in which there is a resemblance to this. What else is hemp used for? — and which is the best?

Mr. E. That which grows in England is stronger than what is produced in any other country. Suffolk is the principal county where hemp is grown and manufactured. The cloth made from it is more durable and warmer than the flaxen linen, and it becomes also whiter by age and use. The sheeting imported from Russia has one advantage, for, being drawn from the distaff, the fibres are longer, and less crossed, than those in the thread made by machinery. Hemp is said to draw away insects that feed on other vegetables. In many parts of

the Continent a belt of hemp is sown round the gardens, or any particular spot which is wished to be preserved from flies or caterpillars. The common height of the plant is from five to six feet. In Catalonia it has been seen seven feet high. In Alsace it is often more than twelve feet high, and upwards of three inches in circumference. Now, mamma, suppose we try and give some account of cotton.

Mrs. E. I was thinking of doing so, and, if you please, I will begin. Solomon obtained a branch of this plant from Tyre. Alexander sowed its seed in the city to which he gave his name, and Constantine transplanted it into Constantinople. Edward the First planted it on the banks of the Thames about the year 1296; but perhaps papa can go much farther back — if so, I will pause a few moments.

Mr. E. Pliny states, that in the higher parts of Egypt, towards Arabia, there grows a shrub or bush which produces cotton. He says, the plant is small, and bears a fruit resembling the bearded nut, or filberd, out of the inner shell or husk of which the downy cotton breaks forth, which is easily spun; and is superior, for whiteness and softness, to any flax in the world. Of this cotton the Egyptian priests delighted to have their robes made. He says, also, that, in an island in the Persian Gulf, there were cotton-trees that produced fruit as large as quinces, which opened when ripe, and were full of down, from which was made fine and costly cloth, like linen. Virgil, too, seems to refer to the same plants, when he speaks of—

'Ethiopian forests bearing wool,
Or leaves from whence the Seres fleeces pull.'

The silk-cotton* is now to be met with in every village in Sumatra. In appearance, this is one of the most beautiful raw materials which the hand of nature has presented. Its fineness, gloss, and delicate softness, renders it to the sight and touch much superior to the produce of the silk-worm; but, such is its brittleness and shortness, that it is considered unfit for the reel and loom, and is only used for stuffing matresses and pillows. The tree is a remarkable one. Some travellers have called it the umbrella-tree. Mr. Marsden compares it to the piece of furniture we call a dumb-waiter, consisting of a gradation of circular shelves on one axis.

Mrs. E. There are several species of the cotton-tree. The common Levant cotton, which is cultivated in several islands of the Archipelago, becomes, in six months, as large as a European quince. It bears rich sulphur-colored flowers, which are very large and beautiful. After they fall, a head of seed appears, which, when it comes to maturity, bursts open, scatters its contents, and discovers the white cotton. In China, the variety is particularly cultivated that produces the cloth called Nankeen. The down covering the seed is called cotton-wool, which is white in the common plant, but in this it has the tinge it preserves when spun and woven into cloth. In India, your favorite insects, Emma, find singular habitations. On one cotton-tree,

* Bombax ciba.

say some recent travellers, a gentleman counted a hundred and eighty distinct hives, belonging to as many swarms. It might, indeed, be called 'a realm of bees,' comprehending so many 'towered cities,' filled with the 'busy hum' of their industrious population. The natives take these nests in the night-time, by making a fire under the tree: they ascend the stem wrapped in a thick woollen cloth, and when they have reached the boughs, they cut off the combs, leaving them to fall upon the ground. The Barbadoes cotton-tree has a stem from six to fifteen feet high, is propagated by seed, set in rows, about five feet asunder, and produces two crops annually. Each plant is reckoned to yield about a pound weight. When the pods are nearly expanded, the wool is picked, and laid in small quantities on a machine made with two or three rollers; whence it falls into a sack placed underneath, and leaves the seeds behind. The cotton is then carefully picked, cleaned, and stowed in bags, where it is well trodden down, that it may be close and compact; the marketable weight of each being three hundred pounds. An acre produces, on an average, nearly that quantity. But papa can tell you a great deal about its manufacture. When I have listened once more, I shall be better acquainted with it than I am.

Mr. E. As cotton is easily grown and collected, the patient industry and simple habits of the people by whom it was cultivated enabled them to send to Europe their manufactured stuffs, of a fine and durable quality, even from the time of the ancient Greeks. Before the discovery, how-

ever, of the passage to India by the Cape of Good Hope, cotton goods were very costly in Europe. M. Saywell observes that, though cotton stuffs were cheaper than silk, which was formerly sold for its weight in gold, they still could only be purchased by the most wealthy, and that, could a Grecian lady awake from her sleep of two thousand years, her astonishment would be unbounded to see a simple country girl clothed with a gown of printed cotton, a muslin kerchief, and a colored shawl.

E. Why, papa, everybody may see that now-a-days; it was only yesterday that Ruth, when she went out with Edward, had all of them on new; and Jane has got another new ——

Mr. E. That will do, my dear; fine things, as well as new ones, are far too common. In the seventeenth century, France began to manufacture into stuffs the *raw* cotton imported from India, as Italy had done a hundred years before. A cruel act of tyranny drove the best French workmen, who were Protestants, into England, and we thus learned the manufacture. The same act of despotism caused the settlement of silk manufacturers in Spitalfields. We did not make any considerable progress in the art, nor did we use cotton exclusively in making up the goods. The warp, or longitudinal threads of the cloth, were of flax; the weft only was of cotton; for we could not twist it hard enough, by hand, to serve both purposes. This weft was spun entirely by hand, with a distaff and spindle — as it is still done by the natives of India. Notwithstanding these disadvantages, our manufacture con-

tinued to increase, so that, about 1760, though there were fifty thousand spindles at work in Lancashire alone, the weavers found the greatest difficulty in procuring a sufficient supply of thread. Neither weaving nor spinning were then carried on in large factories. They were domestic occupations: the women of a family worked at the distaff or hand-wheel; and there were two operations necessary in this department. Roving, or coarse spinning, reduced the carded cotton to the thickness of a quill, and the spinner afterwards drew out and twisted the roving into weft fine enough for the weaver: English cotton goods were, therefore, very dear, and had but little variety. The cloth made of flax and cotton was called fustian; and we still received the calicos and printed cottons from India. But an amazing change was about to take place. Richard Arkwright, of Preston, invented, in 1769, the principal part of the machinery for spinning cotton, and thus gave bread to about two millions of people instead of fifty thousand; and, assisted by subsequent inventions, raised the importation of cotton-wool from India from less than two millions of pounds per annum, to two hundred millions; set in motion six millions of spindles, instead of fifty thousand; and increased the annual produce of the manufacture from two hundred thousand to thirty-six million pounds sterling!

F. Amazing, papa! — amazing! But how did he do this?

Mr. E. He asked himself whether it was not possible, instead of a wheel which spins a single thread of cotton at a time, yielding about two ounces of thread in twenty-four hours, to spin

the same material on a great number of wheels, from which many hundred threads might issue at the same moment. This, at length, he accomplished. But how could a machine do the work of fingers? I will tell you. Suppose the cotton-wool to be carded; that is, so combed and prepared as to be formed into a long untwisted line about the thickness of a man's finger; and this, when introduced into the machine I am about to describe, is called a roving, the old name in hand-spinning. Now, to make this roving into a thread, the fibres, which are mostly curled up, and lie in all directions, must be stretched out and laid lengthways, side by side, pressed together so as to give them a more compact form, and twisted so as to unite them all firmly together. To do this, Arkwright employed two pair of small rollers, one being placed at a little distance before the other; the lower roller, too, in each pair, was furrowed lengthways, and the upper one was covered with leather; so that, as they revolved in contact with each other, they might take fast hold of the cotton which passes between them: when, then, a roving is put between the first pair of rollers, the effect was merely to press it into a more compact form; but, as soon as it has passed through this, it is received between the second pair, and, as these revolve with greater celerity than the first, they draw the roving forwards with greater rapidity than it is given out by the former. In consequence of this, the roving is lengthened in passing from one pair to the other; and the fibres of which it is composed are drawn out and laid lengthways, side by side; the increase

of length being exactly proportioned to the increased velocity of the second pair of rollers.

F. Does only one roving pass at a time, papa?

Mr. E. No, my dear, two or more are generally united; and thus, suppose two are introduced, and that the second pair of rollers move twice as fast as the first, the new roving formed of the two will be exactly twice the length of the original ones. But its parts will be very differently arranged, and its fibres will be drawn out longitudinally, and will be much better fitted for forming a thread. This operation of doubling and drawing is repeated as often as necessary, and the requisite degree of twist is given by a machine similar to the spindle and fly of the common flax-wheel. The fineness with which the cotton thread can be drawn out, by this machinery, may be gathered from the fact that Mr. John Pollard, of Manchester, spun, in 1792, no fewer than two hundred and seventy-eight hanks of yarn, forming a thread upwards of one hundred and thirty-two miles in length, from a single pound of raw cotton. Of the rapidity with which some portions of the machinery work you may judge when I tell you, that the very finest thread, which is used in making lace, is passed through the strong flame of a lamp, which burns off the fibres, without burning the thread itself. So quickly indeed does it go that no motion can be perceived.

E. It is a most extraordinary story, papa: who would have thought of machines working like fingers? If I were to think, aye, till I was as old as Sally Tomkins at the lodge — and she is

more than ninety — I couldn't have told how it might be done.

Mr. E. That is very likely, my dear; yet the proper employment of your little mind will be of great service to you and to others. But perhaps you will be still more surprised when I say that machines have been invented that *make* machines that make the cotton thread; for there is a part of the machinery used in cotton-spinning called a reed. It consists of a number of pieces of wire, set side by side in a frame, resembling, in some degree, a comb with two backs. These reeds are various as to length and fineness; but they all consist of cross pieces of wire, fastened at regular intervals between longitudinal pieces of split cane, into which they are tied with waxed thread. But a machine does now the work of reed-making. The materials enter the machine in the shape of two or three yards of cane, and many yards of wire and thread; and the machine cuts the wire, places each small piece with unfailing regularity between the canes, twists the thread round the cane, with a knot that cannot slip, every time a piece of wire is put in, and does several yards of this work in a very short space of time. Another machine is even more wonderful. The cotton-wool is combed by circular cards of every degree of fineness; and the card-making machine, receiving only a supply of leather and wire, does its own work without the aid of hands. It punches the leather, cuts the wire, passes it through the leather, clenches it behind, and gives it the proper form of the tooth in front; producing a complete card of several feet in circumference with amazing rapidity.

E. And, papa, *you* have seen all this! When you visit Mr. Grenville at Manchester again, do take mamma, and Frederick, and me! Birds and insects are very ingenious; but now I see even wood and iron are made quite clever, and do the work of hands and heads!

Mr. E. I have seen all this, my love; and by such means it is that so much cotton cloth is made in England, that three hundred and sixty million yards were exported, and three hundred and ninety million were retained for home consumption, on an average of years from 1824 to 1828. We cannot proceed now with the process of printing, but I may give you an account of the mode in a distant spot: 'At one place,' say Messrs. Tyerman and Bennet, 'in the house of a chief, where we were hospitably entertained, we had an opportunity of witnessing the method of printing flowers and other ornamental figures on the native cloth. Four women were industriously employed in this work. The design is neatly engraved upon the sides of thin pieces of bamboo, into the lines of which the colors are introduced by dipping them into calabashes (cocoanut shells) containing the dye in a liquid state, and the superfluous matter is thrown off from the smooth surface by striking the bamboo sharply on the edge of these vessels. The pattern is then carefully transferred to the cloth by pressure of the hand; after which the fibre of cocoa-husk dipped in the coloring matter, any imperfections are supplied, and the whole is delicately finished off. This work is executed with considerable expedition as well as accuracy; and if

not borrowed from the suggestions of European visiters (which is hardly probable), it may be said that *printing*, as well as *engraving*, are orginal inventions of the Sandwich Islanders, both being used in this ingenious process.'

Mrs. E. The mode adopted in this country is too complicated for explanation now; but ingenuity and industry are in all directions performing wonders. 'In England,' says Dr. Arnott, 'a man of small fortune may cast his regards around him, and say with truth and exultation, 'I am lodged in a house that affords me conveniences and comforts which even a king could not command some centuries ago. There are ships crossing the seas in every direction, to bring what is useful to me from all parts of the earth. In China, men are gathering the tea-leaf for me; in America, they are planting cotton for me; in the West India Islands, they are preparing my sugar and my coffee; in Italy, they are feeding silk-worms for me; in Saxony, they are shearing the sheep to make me clothing; at home, powerful steam-engines are spinning and weaving for me, and making cutlery for me, and pumping the mines, that minerals useful to me may be procured. My patrimony was small, yet I have post-coaches running day and night, on all the roads, to carry my correspondence; I have roads, and canals, and bridges, to bear the coal for my winter fire: nay, I have protecting fleets and armies around my happy country, to secure my enjoyments and repose. Then I have editors and printers, who daily send me an account of what is going on throughout the world, among

all these people who serve me. And in a corner of my house I have Books! — the miracle of all my possessions, more wonderful than the wishing-cup of the Arabian tales; for they transport me instantly, not only to all places, but to all times. By my books, I can conjure up before me, to vivid existence, all the great and good men of antiquity; and, for my individual satisfaction, I can make them act over again the most renowned of their exploits: — the orators declaim for me; the historians recite; the poets sing: in a word, from the equator to the pole, and from the beginning of time until now, by my books I can be where I please. This picture is not overcharged, and might be much extended; such being the miracle of God's goodness and providence, that each individual of the civilized millions that cover the earth may have' — and it might have been said, by such simple yet wonderful means as we have been describing,—' nearly the same enjoyments as if he were the single lord of all.'

F. Thank you, dear papa and mamma, a hundred — a thousand times.

THE CONSERVATORY.

'I SHOULD imagine, from the expression of your countenance, Emma,' said Mrs. Elwood, 'that you have just been thinking of something very pleasing.'

'You are quite right, mamma,' was the reply; 'and I will tell you what it was. I am sure you remember the charming day we had when we visited the Colosseum. What a fine panorama, too, we saw! And, then, how pleased we were when we sat in front of the Swiss cottage; though, you know, I did not like the eagle's chain: but I shall never forget when you opened one of the doors of the conservatory, and we had before us that beautiful range of flowers, with the fountain at the end, sending up its bright streams, which curled and curled, and fell again and again.—Oh, I do n't know when I was so much delighted!'

'I was not surprised at your pleasure, love,' said Mrs. Elwood; 'the mind that could not enjoy such a scene must be insensible indeed; but you have just anticipated our intention, which was to resume our account of the structure of plants, and to tell you something about flowers. Papa, I see, is quite ready, and I should like him to begin.'

Mr. E. Flowers are among the most exquisite objects of the vegetable world. How various their forms! — how beautiful their tints! — how delightful their perfumes! No two are exactly alike — even though they are of the same species, and grow on the same stalk. And, then, they

do not all come at once; they appear in a well-ordered succession; and thus, short-lived as they are, we have them almost all the year round. First comes the early snow-drop, like 'a little billet flung from the delicate hand of Spring, to command the departure of winter;' the crocus appears next, but, in its timidity, keeps close to the earth; then rises the violet, arrayed in beauty, with the polyanthus and auricula as her courtly attendants; afterwards, rain-bow-headed tulips spring forth richly, and anemonies follow in their train; while the ranunculus, lily, carnation, and the queen-like rose, with others too numerous to be told, close the gay and lovely procession.

Flowers have been regarded, from early times, as expressive of certain feelings: the yellow-green, which appears at the falling of the leaf, was worn in chivalry as the emblem of despair; brown is considered an indication of sorrow; red, of anger; and green, of tranquillity. The violet is an acknowledged emblem of retiring merit; the rose, of beauty; the aloe, of constancy; the palm, of victory; the laurel, of honor; and the lily of the valley — modestly peeping forth from her verdant mantle, and shedding her sweetest fragrance in retirement — of humility.

Mrs. E. 'A few miles from Adowa,' says Mr. Salt, in his Voyage to Abyssinia, 'we discovered a new and beautiful specimen of amaryllis, which bore from ten to twelve spikes of bloom on each stem, as large as those of the belladonna, springing from one common receptacle. The general color of the corolla was white, and eve-

ry petal was marked with a single streak of bright purple down the middle. The flower was sweet-scented, and its smell, though much more powerful, resembled that of the lily of the valley. The superb plant excited the admiration of the whole party; and it brought immediately to my recollection the beautiful comparison used on a particular occasion by our Saviour:—'I say unto you, that Solomon in all his glory was not arrayed like one of these.'' In the Song of Solomon we read of 'lilies dropping down sweet-smelling myrrh,' which some have supposed to refer to the Persian lily, which is red, and always bent downwards, and disposed like a crown at the extremity of the stem, which has a tuft of leaves at the top. At the bottom of each leaf a moisture appears, forming, as it were, a white pearl, and gradually distilling very clear and pure drops of water, which may perhaps, in this case, be called myrrh.

Mr. E. And we must not forget the rose of Persia, which Sir R. K. Porter has so well described. 'On first entering the bower of fairy land, I was struck by the appearance of two rose-trees, full fourteen feet high, laden with thousands of flowers, in every degree of expansion, and of a bloom and delicacy of scent that imbued the whole atmosphere with the most exquisite perfume; indeed, I believe that in no country of the world does the rose grow in such perfection as in Persia—in no country is it so cultivated and prized by the natives. Their gardens and courts are crowded with its plants, their rooms are ornamented with vases filled with its gather-

ed branches, and every bath strewed with the full-blown flowers, plucked from the ever-replenished stems. Even the humblest individual, who pays a piece of copper money for a few whiffs of a kalioun, or pipe, feels a double enjoyment when he finds it stuck with a bud from his dear native tree; but in this delicious garden of Negauvistan the eye and the smell were not the only senses regaled by the presence of the rose; the ear was enchanted by the wild and beautiful notes of the multitude of nightingales, whose warblings seem to increase in melody and softness with the unfolding of their favorite flowers; verifying the song of their poet, who says, 'When the charms of the bower are passed away, the fond tale of the nightingale no longer animates the scene!'' It was right to consecrate a flower so lovely as the rose to the service of religion. Solomon, accordingly, chose it to represent the Redeemer, when he said, 'I am the rose of Sharon;' and Isaiah gives us some faint conception of the change to be produced on the moral world when he says, that 'the wilderness shall rejoice, and shall blossom as the rose.' Mamma will now describe some parts of a flower.

Mrs. E. The calyx, or flower-cup, forms a covering, to shelter and defend the bud before it expands. Look, it consists of several parts, which resemble small leaves, both in form and color, and probably act in the same manner. Now, this part varies, so that in the hemlock it is a fence, in the hazel a catkin, in the daffodil a sheath, in the oat and the grasses a husk, in mosses a veil, in mushrooms a curtain, and in

the polyanthus a cup. Above the calyx rises the corolla, the colored part of the flower. It consists of several petals, distinct or separate, or else forming a corolla of one single piece, in which case the flower is called monopetalous. When the petals first expand, they still serve to protect the parts in the centre, and also reflect the sun's rays on them, thus rearing them as in a hothouse. When they are full grown this heat is no longer necessary; and, as light and air are now beneficial, the petals expand, leaving these delicate organs to enjoy their full power.

Mr. E. The corolla is the festive hall of multitudes of insects. I remember a naturalist says, 'The principal flower in a bouquet was a carnation, the fragrance of which led me to enjoy it frequently and near, while the ear was constantly assailed by an extremely soft but agreeable murmuring sound. I instantly distended the lower part of the flower, and, placing it in a full light, could discover, by a glass, troops of little insects frisking and capering with wild jollity among the narrow pedestals that supported its leaves, and the little threads that occupied its centre. What a fragrant world for their habitation! What a perfect security from all annoyance in the deep husk that surrounded their scene of action!

'The microscope, on this occasion, had given what nature seemed to have denied to the objects contemplated. The base of the flower extended itself to a vast plain; the slender stems of the leaves became trunks of so many statelyc edars; the threads in the middle seemed columns of

massy structure, supporting at the top their several ornaments; and the narrow spaces between were enlarged into walks, parterres, and terraces.

'On the polished bottom of these, brighter than Parian marble, walked alone, in pairs, or in large companies, the winged inhabitants, stained with living purple, and with a glossy gold that would have made all the labors of the loom contemptible in the comparison. There were the perfumed groves, the more than myrtle shades of the poet's fancy; here the happy creatures spent their days in sportive gaiety; or, in the triumph of their little hearts, skipped after one another from stem to stem among the trees, or winged their flight to the close shadow of some broader leaf, to revel undisturbed in the heights of felicity.'

Mrs. E. That is, indeed, a lively description, my dear, of the tenants of a flower. At the base of the petals, however, I wish you to observe, the nectary is generally situated, so called from its secreting a sweet fluid to which has been given the name of nectar; and which may often be sucked from the tube of the honeysuckle. Many insects have a long and plaint proboscis, or trunk, for the purpose of obtaining this grateful food, among which that of the Unicorn Moth* is very remarkable. It carries it rolled up in concentric circles, and occasionally extends it to above three inches in length. This trunk consists of joints and muscles, and its movements seem to be more various than those of the ele-

*Sphinx convolvuli.

phant's proboscis; and, near its termination, it is split into two capillary, or hair-like, tubes: thus it robs the flowers of the honey, though it flies only in the evening, when they have closed their petals, and are, consequently, more difficult of access. In the centre of the flower the seed is lodged. It is enveloped in a small leaf, which, instead of expanding to the sun and air, like its neighboring petals, folds itself more closely round the little treasure: the edges of the two opposite halves of the leaf being thus brought into contact, they unite and grow together, and the leaf assumes the form of a pod or vessel, the shape of which varies according to the manner in which the leaf was folded when it first budded.

Mr. E. We may form an idea of other seeds by the structure of a pea, a bean, or the kernel of a melon — the formation being nearly the same in all. Remove the covering which enfolds a seed, and you will generally perceive two pieces, called lobes, which are separated with ease, and are nothing more than the composition of a kind of meal for the nourishment of the young plant. At the top of the lobes is the bud, which is composed of a stock and a pedicle, and the latter will afterwards be the root. The stem, or body of the plant, is sunk a little into the inward substance of the seed, and the pedicle, or small root, first appears, when the seed begins to germinate. The pedicle is connected with the lobes by two branching tubes, whose ramifications are dispersed through the lobes, from which they derive the necessary support for the young plant. The stock, or body of the plant, is enclosed by two

leaves, which are designed for its preservation till it appears above the ground. These two leaves are the first parts of the plant which disengage themselves from the seed, and are the forerunners of the trunk, the exceeding delicacy of whose texture they protect till more matured, and then fall off. After the tender root has been nourished for some time by the lobes, it shoots in various directions into the earth, and derives from it the support it ceases to collect from the lobes. All seeds, whether small or large, contain the parts now mentioned, in some way or other, wrapped up carefully in one or more coverings, to protect the whole of the curious apparatus enclosed. The seed being of the highest importance, it is more defended than other parts, as in the esculent, or eatable fruits, by soft, pulpy substances; as in the leguminous vegetables, such as beans and peas, by thick membranes; or, as in the nut, by a bony or hard outer skin, called the shell. When the seed falls into the earth, and has accumulated sufficient moisture, it swells and bursts, the root shoots downwards, and the stem rises upwards. If any parts are destroyed the plant is injured, but nature will restore them by fresh shoots: the neck, or part which unites the stem and the root, being the only part the destruction of which proves fatal.

F. Why, papa, does the stem always rise, and the root descend?

Mr. E. The roots grow only at the extremities, and these, being at first so soft as to be almost liquid, naturally follow the direction of

gravity, and descend, unless they meet with a stone or clod of earth which they cannot penetrate, when they grow laterally, or side-ways, to avoid the obstacle. A curious experiment was once made, to see if it was gravity which makes the roots of a plant descend. Mr. Knight sowed seeds in moss disposed in cavities, arranged on the circumference of a water-wheel. The cavities were open on both sides, so that the root and the stem might germinate at either. The wheel was then made to revolve one hundred and sixty times in a minute. The roots always struck in the direction diverging from the centre, like the spokes of a wheel, whence he concluded that in this process the centrifugal force, or the tendency to fly off from the centre, had replaced that of gravity.

Mrs. E. There is, however, a singular plant,* the seed of which opens, and puts forth a little spiral body, that is, winding like a cork-screw, which does *not* seek the earth to take root, but climbs from right to left up other plants, from which, by means of vessels, it draws its nourishment. The little spiral body, proceeding from the seed, is to be compared with the fibres which the seeds send out in ordinary cases; and the comparison ought to regard both the form of the threads, and the direction they take. They are straight, this is spiral; they shoot downwards, this points upwards. In the rule, and in the exception, the design is equally perceived.

* Cuscuta Europæa.

Mr. E. Plants not only possess a proper organization for the production of seed, but also means for its dispersion abroad. Some seeds have a tuft of light soft down, such as those of the thistle, dandelion, &c., which are often blown by the wind to a considerable distance. Others have wings, which have been known to carry them fifty miles from the spot that gave them birth. The seeds of the various species of violets are contained in a capsule, a dry hollow seed-vessel with a single cell, but consisting of three pieces or valves. To the inner part of each of these a seed is attached, and it remains so for some time after the valves, in the process of ripening, have separated and stood open. The sun's heat causes the sides of each valve to shrink, and then the edges press firmly on the seed, which is not only extremely smooth, polished, and shining, but regularly egg-shaped. Thus, when the collapsing or shrinking edge of the valve slides gradually and forcibly down over the sloping part of the seed, it is thrown with a jerk to a considerable distance. It is remarkable, too, that the capsule hangs drooping before the seed is ripe, with the calyx spread over it like an umbrella, to defend it from the rain and dews, which would retard the ripening; but, no sooner is this completed, than the capsule becomes almost upright, with the calyx for a support; and thus the mechanism for scattering the seeds is more effective, as the capsule thus rises higher — sometimes more than an inch. 'Some ripe capsules of a fine variety of heart's ease,' says Mr. Rennie, 'which I placed in a shallow

paste-board box, in a drawer, were found to have projected their seeds to the distance of two feet. From the elevation of a capsule, therefore, at the top of a tall plant, these seeds might be projected twice or thrice that distance.'

E. All this is very surprising; I wonder whether there is anything else as curious respecting seed?

Mrs. E. Yes, my love, two or three facts now occur to me. When the seeds of the cyclamen are ripe, the stalk of the flower gradually twists itself spirally downwards, till it touches the ground, and, forcibly penetrating the earth, lodges its seeds; which, being found not to grow in any other situation, are thought to receive nourishment from the parent root. The subterranean trefoil,* too, also buries its seed; the globular head of the seed penetrating the earth. This, however, may be only intended to conceal the seed of the plant from the ravages of birds, for there is another trefoil,† a globular, wooly-headed one, which has a curious way of concealing its seeds; the lower florets only have corols, and are fertile; the upper ones wither into a kind of wool, and, forming a head, completely hide the fertile calyxes. Before we pass on, I may just remark, that the increase from a seed is truly amazing. That of a globe-turnip is exceedingly minute — not larger, perhaps, than the twentieth part of an inch in diameter, and yet, in the course of a few short months, this seed will be formed, by the soil and the atmosphere, into a solid bulb, containing, in some cases, twenty-seven millions of times the bulk of the seed, and

* Trifolium Subterraneum. † Trifolium Globosum.

this in addition to a considerable bunch of leaves. The number of seeds produced by some vegetables is also very astonishing: more than thirty thousand have been found in a single head of poppy. In the great cat's tail * the seeds are blown off by the wind, and, no doubt, many are lost; but each spike generally bears above forty thousand seeds; so that upon three spikes, which each plant commonly produces, there are annually more than a hundred and twenty thousand seeds. The Tobacco † has been known to produce, on one plant, three hundred and sixty thousand seeds; and the yearly produce of a single stalk of spleenwort (a kind of fern) has been estimated at a million!

E. Most wonderful, mamma! — most wonderful! But what are the other parts of a flower?

Mrs. E. From the seed-vessel rises a little thread-like stalk, called a style, which supports a small spongy substance, denominated the stigma, and these three parts form a whole, which bears the name of carpel. A single carpel forms the pistil of some flowers; but pistils are generally composed of several carpels, which, in most flowers, are neatly fitted and joined together. Immediately surrounding the pistil are the stamens, each of which consists of a slender filament, or thread, supporting a little bag called an anther, which is filled with pollen, a species of dust or powder. The anthers, when ripe, burst, and, being more elevated than the stigma, shed their pollen upon it, without which the seed

* Typho major. † Nicotiana Tabacum.

would not vegetate; and thus it is perfected. The pollen is sometimes conveyed by winged insects, which, in penetrating, by means of their long and pliant trunks, the recesses of the corolla, in order to obtain the nectar, cover their downy wings with the pollen; they then bear it to the next flower, on which they alight; and, in working their way to the nectary, it is rubbed off, and falls on the stigma. Thus they compensate the flower for stealing its honey. In Persia, very few of the date and palm trees under culture have stamens, those having pistils being preferred as alone yielding fruit. In the season of flowering, the peasants gather branches of the wild palm-trees whose blossoms contain stamens, and spread them over those which are cultivated, in order that the pollen may come in contact with the pistils, and render the seeds fruitful. In Italy there are two remarkable palm-trees; the one, situated at Otranto, has no stamens; the other, at Brindisium, which is almost forty miles distant, has no pistils; consequently, neither of these trees bore seed; but when, after the growth of many years, they rose above the trees of the neighboring forests, and all the buildings which intervened, the pollen of the palm-tree at Brindisium was wafted by the wind to the pistils of that at Otranto, and, to the astonishment of every one, the latter bore fruit.

Mr. E. The only part of the flower which now requires to be adverted to is the stalk, which is called a peduncle, or pedunculus. It generally expands a little at the top, and forms a common base by which the several parts of the

flower are connected together. The peduncle is not always crowned by a flower; it often branches out into a number of smaller flower-stalks, called pedicles, each of which supports a flower. The common daisy deserves particular attention; for, if the parts that are within the cup are pulled off, and examined with a glass, it will be found that the yellow spots are the tops of little flowers; and, if one of these is opened, it will be seen that each little blossom is shaped like a funnel, with five divisions in its border, and that the whole is most exquisitely constructed.

Mrs. E. I should like you, Emma, to associate with that simple flower the charming lines written by Montgomery on a daisy in full bloom on Christmas day. I have just thought of some of them, and I will show you an air to which they may be sung delightfully.

THE DAISY.

'There is a flower, a little flower,
With silver crest and golden eye,
That welcomes every changing hour,
And weathers every sky.

The prouder beauties of the field
In gay but quick succession shine,
Race after race their honors yield—
They flourish and decline.

But this small flower, to nature dear,
While moons and stars their courses run,
Wreathes the whole circle of the year,
Companion of the sun.

The lambkin crops its crimson gem,
The wild-bee murmurs on its breast,
The blue-fly bends its pensile stem,
Light o'er the sky-lark's nest.

'T is Flora's page: in every place,
In every season, fresh and fair,
It opens with perennial grace,
And blossoms every where.

On waste and woodland, rock and plain,
Its humble buds unheeded rise:
The rose has but a summer reign,
The *daisy* never dies.'

E. That is very sweet indeed, mamma: you will tell me the air, and that I know will be delightful too; and I will play and sing it as well as —as well as ever I can. But what makes the odor of flowers?

Mrs. E. The basis of all the vegetable perfumes is formed by the volatile or essential oils, which are contained, more or less, in every part of the plant, except the seed. They are very plentiful in the leaves of geraniums, of mint and thyme, and all the sweet-smelling herbs; in sandal and cedar-wood; and in the rind of fruits, as in oranges and lemons; from which they may be extracted by the slightest pressure. They vary greatly as to consistence, some being as thick as butter, whilst others are as fluid as water. To prepare them for perfumes or essences, they are first properly purified, and then mixed with a large proportion of water, as is often done with peppermint; or distilled with spirit of wine, as is the case with lavender-water.

E. I have seen you, mamma, take spots of grease out of cloth or silk by some of these things: pray how is that done?

Mrs. E. Volatile oils, and the spirit in which they are distilled, will dissolve wax, tallow, spermaceti, and resins; if, then, any of these substances make the spot, they will combine with it, and remove it.

F. I love a garden dearly, papa. I am surprised that every body does not. How strange I thought it when Mr. Kerrison said the other day that he did not walk in his once a month!

Mr. E. You will find the tastes of people very different, Frederick. Some have no pleasure in the process of vegetation, and, were their grounds left to themselves, all would be wildness and disorder. Others, on the contrary, owe much of their enjoyment to flowers and fruits, and to possess it surmount many obstacles. In China, even the steepest mountains are brought into cultivation; they are cut into terraces, resembling, at a distance, immense pyramids, divided by numerous steps or stories; and, what is really worthy our admiration, the water, which runs at the foot of the mountain, is raised from terrace to terrace to the very top, by means of a portable chain-pump, which may be carried about and worked by two men. Reservoirs are also dug on the tops of the mountains, from which the rain-water is let down to irrigate the sides. In such places as are steep, or too barren, pines and larches are planted. But what would you think of floating gardens?

F. Why, papa, that would be strange!

Mr. E. The Chinampas, or floating gardens of Mexico, are justly considered objects of the greatest curiosity. Their invention is said to have arisen out of the extraordinary situation in which the Aztecs were placed on the conquest of their country by the Tepanecan nation, when they were confined, in great numbers, to the small islands on the lake, and were driven to

exercise great ingenuity, in order to provide themselves with a sufficient quantity of food. Humboldt conjectures that the first idea of them may have been suggested by nature herself; for, on the marshy banks of the lakes of Xochimilco and Chalcho, the agitated waters, in the time of the great floods, carry away pieces of earth, covered with herbs, and bound together with roots. The first Chinampas were mostly fragments of ground artificially joined together and cultvated. Following up this suggestion, it would not be difficult, by means of wicker-work, formed with marine plants, and a substratum, or ground-work of bushes, combined with tenacious earth or clay, to construct similar gardens, of adequate dimensions. Upon these was placed fine black mould, sufficiently deep for the sustenance of the plants which it was desired to raise. The form usually given to these Chinampas was quadrangular, and their size varied from one hundred and fifty to three hundred feet in length, with a breadth of from twenty to seventy feet. At first, the use of them was confined to the growth of maize and other objects of absolute necessity; but, in the progress of time, and when the Mexicans had shaken off the yoke which rendered them necessary, the owners applied themselves to the production of vegetable luxuries, and grew fruits, and flowers, and odoriferous plants, which were used for the embellishment of their temples, and the gratification of their nobles. At sun-rise, daily, according to the Abbe Clavigero, innumerable boats were seen to arrive at the city of Mexico, loaded with various kinds of flowers and

herbs, the produce of these floating islands. The garden is sometimes seen to contain the cottage of the Indian, who is employed to guard a contiguous group, and on each one there is commonly erected a small hut, under which the cultivator can shelter himself from storms, or from the intense heat of the sun. If it is wished to put the garden in a different place, this is easily effected by means of long poles, or by rowers placed in a boat to which the garden is fastened. In the driest seasons, the Chinampas are always productive, and it is not difficult to renew the powers of the soil by means of mud taken from the bottom of the lake, which is highly fertilizing. One of the most agreeable recreations afforded to the citizens of Mexico is that of proceeding, in the evening, in small boats, among these gardens, the vegetation upon which is always in a state of luxuriance.

Floating gardens are maintained also on some of the rivers and canals of China, where an excessive population produces the same effect as that just mentioned as having resulted from oppression, and the inhabitants are obliged to have recourse to every expedient for increasing the means of subsistence.

Mrs. E. Some plants are very extraordinary. One is a native of Java, and of the East Indies beyond the Ganges,* and is denominated aerial from its singular properties. In the latter region, it is no uncommon thing for the inhabitants to pluck it up, on account of the elegance of its leaves, the beauty of its flower, and the exquisite

* Epidendrum flos aeris.

odor it diffuses, and to suspend it by a silken cord from the ceilings of their rooms; where, from year to year, it continues to put forth new leaves, new blossoms, and new fragrance, excited alone to fresh life and action by the stimulus of the surrounding atmosphere. In the botanical garden, at Mexico, there is a tree of considerable size, called 'the tree of the little hands,' bearing a beautiful red flower, the centre of which is in the form of a hand, with the fingers a little bent inwards. Over these, humming-birds, in all their beautiful, splendid hues, may be seen frequently hovering. But only three trees of the kind exist in all Mexico. The mountains of Toluca produce a very singular species of cactus, which looks exactly like an old man's head, as it is covered with long grey hair, which completely conceals the thorns. The American aloe, which was first brought into Europe in 1561, and is now planted for hedges in Spain, Sicily, and Calabria, has been thought to blossom only once in a hundred years; but the time of its flowering depends on the quickness of its growth; so that, in hot countries, where it grows fast, it will blossom in a few years; but, in colder climates, it is much longer before the stem shoots up. When vigorous, it grows to the height of more than twenty feet. The tallest aloe of which there is any account, was in the garden of the King of Prussia, and grew to the height of forty feet. In another, which flowered in Cheshire, in 1737, the stem appeared in June, and grew five inches a day for some weeks; the flower-branches were perfected in twelve weeks,

and then ceased to grow for a month, while the buds were forming. This plant produced a thousand and fifty flowers; but one that blossomed in Leyden, in 1760, produced more than four thousand. Dr. Walsh saw, in Brazil, an aloe of extraordinary size. The flower-stem was two and a half feet in circumference at the base, and shot up to the height of thirty feet; from this projected innumerable horizontal foot-stalks, from whence hung myriads of campanulate blossoms, so that the form of this grand flower was that of a pine tree, for which it might have been mistaken. 'I saw in some places,' he says, 'when I set out, this stem beginning to protrude itself from the midst of the leaves, and on my return it had attained the magnitude of a pine-tree of twenty years' growth.'

Mr. E. The embeaporba* stands with a naked stem, surmounted by bare branches, from the extremities of which immense palmated leaves depend. In some species, these are covered, on the under side, with a hoary down, which, in the heat of the day, they turn up to the sun, so that whole patches of the surface seem covered with rich white blossoms. With this is strikingly contrasted the coral-tree. † Spikes of rich scarlet blossoms stand erect on the branches, as large as those of a horse-chestnut, and give to the surface a glow of the brightest red. A curious peculiarity marks its leaves; the mimosas and acacias, which grow near it, expand their foliage to the utmost in the sun, and close them up when

* Cecropia pellata and palmata.

† Erythrina Corolladendrum.

he is obscured by the clouds; but the erythrina seems actuated by an opposite instinct. It closes up its large trefoil leaves in the heat of the sun, as if protecting its buds from his burning rays.

Mrs. E. The most remarkable flower, however, that has yet been discovered, is one found in the island of Sumatra, in the year 1818, by Dr. Arnold, who thus described it in a letter to a friend: — 'Here, I rejoice to tell you, I happened to meet with what I consider as the greatest prodigy of the vegetable world. I had ventured some way from the party, when one of the Malay servants came running to me with wonder in his eyes, and said, 'Come with me sir, come! a flower! very large, beautiful, wonderful!' I immediately went with the man about a hundred yards in the jungle, (or wild bushy underwood) and he pointed to a flower growing close to the ground, under the bushes, which was truly astonishing. My first impulse was to cut it up, and carry it to the hut. I therefore seized the Malay's parang, (a sort of instrument like a woodman's chopping-hook), and, finding that it sprang from a small root which ran horizontally (about as large as two fingers, or a little more), I soon detached it, and removed it to our hut. To tell you the truth, had I been alone, and had there been no witnesses, I should, I think, have been fearful of mentioning the size of this flower, so much does it exceed every flower I have ever seen or heard of; but I had Sir Stamford and Lady Raffles with me. The whole flower was of a very thick substance, the petals and nectary being in but few places less than a quarter of an

inch thick, and, in some places, three-quarters of an inch; the substance of it was very succulent. Now for the dimensions, which are the most astonishing part; it measures a full yard across; the petals, which were roundish, and five in number, being twelve inches in length, and it being about a foot from the insertion of the one petal to the opposite one; Sir Stamford, Lady Raffles, and myself, taking immediate measures to be accurate in this respect, by pinning four large sheets of paper together, and cutting them to the precise size of the flower. The nectary, in the opinion of us all, would hold twelve pints, and the weight of this prodigy we calculated to be fifteen pounds. A guide from the interior of the country said that such flowers were rare, but that he had seen several; and that the natives called them Krûbût, or the 'great flower.' You may judge how well they deserve this name, from the dimensions of the buds, which are about the size, and have very much the appearance, of ordinary cabbages.'

E. Why, papa, it would not be right to call it any thing else. It is quite a giant—a Goliah! and other plants must look insignificant by its side. And yet the little daisy, after all, is as nicely formed as that can be.

Mr. E. That is true, my dear; every thing that has come from the hand of God is perfect in its kind: and how many proofs may we find of his benevolence! 'Each bird,' says St. Pierre, 'chooses the plant best adapted to its habits and constitution. Thus, the goldfinch frequents the thistle, because he finds a rampart in its prickly

leaves, food in its seeds, and materials for his nest in its down. The bird-fly of Florida, for similar reasons, prefers the vignonia. This is a creeping plant, which finds its way to the tops of the highest trees, and frequently covers the whole trunk. He builds his nest in one of its leaves, which he rolls into the form of a coronet; he finds his food in its red flowers, which resemble those of the fox-glove: he plunges his little body into them, which appears in the heart of the flower like an emerald set in coral; and he gets in sometimes so far, that he suffers himself to be surprised there and caught.'

E. Oh, mamma, there is one more question I should like to ask! — why should plants and trees be so beautiful in spring, while, in winter, all seems so inactive and cheerless?

Mrs. E. It is one of the effects of heat of which you have heard.* It is supposed that the warmth of spring dilates the vessels of plants, and produces a kind of vacuum, into which the sap, which had previously remained inactive in the trunk, rises; this is followed by the ascent of the sap contained in the roots; and room is thus made for fresh sap, which the roots, in their turn, derive from the soil. Thus the plant blossoms and bears fruit, and ends its summer career; but, when cold weather comes, the vessels contract — the leaves wither — the office of transpiration stops—and the roots cease to absorb sap from the soil. If the plant be an annual, its life then terminates; if not, it remains torpid, or a small quantity of resinous juice slowly rises

* See 'Art in Nature — Chemistry.'

from the stem into the branches, and enlarges their buds; and even in evergreens vegetation proceeds imperfectly. But, for the present, adieu, my dear children!

CHANGES.

'I WAS thinking,' said Mrs. Elwood, as she turned from the open window, through which she had been intently looking, 'how agreeable and delightful is the verdant mantle of Nature. Had it been of a more brilliant hue, it would have overpowered our sight; and, instead of feeling gratified and refreshed, the effect upon us would have been dazzling and painful. If the covering of the earth were dark and sombre, what is now so cheering would produce dejection and despondency: — but we are favored with that peculiar tint, which is the best of all that can possibly be imagined; we enjoy —

"United light and shade! where the sight dwells
With growing strength and ever new delight!"

I was just remarking, too, that the first hues of spring are gone with the snow-drops, violets, and primroses, which were their beauteous and short-lived companions. Even now we may say, as the poet did of autumn,

"It is the season when the green delight
Of leafy luxury begins to fade,
And leaves are changing hourly on the sight:"

For the light tints of young foliage are being displaced by those of a duller green, and in succession the hedges and trees participate the change. But a still more remarkable process is in operation, resembling, in some respects, that which transpires in animal existence, where the form is totally altered; the metamorphosis being not less wonderful than that experienced by a chrysalis when it becomes a gorgeous butterfly.

E. Why, mamma, I never thought that there was anything of the kind among plants, and I cannot now imagine to what you refer.

Mrs. E. Look, love. Here is a pea, and you may observe that the pod consists of a leaf doubled over the seeds, with its edges united. When very young, it is almost flat; but as it grows it becomes rounded on each side, and loses the form and appearance of a leaf. This alteration is necessary, to make room for the peas, which, as they increase in size, of course require more space.

E. I see, mamma; but is it not strange that a leaf should be changed into a pea-pod?

Mrs. E. It is, my love; but it is stranger still that it should be changed into an apple or a nectarine.

E. Oh, mamma! that must be a joke of yours. And yet I think you mean what you say, for you look quite serious, and you don't even smile.

Mrs. E. No, my dear little girl, I am stating what is actually true. Examine a leaf, and you will observe that the upper surface is smooth, and the under one of a rougher texture, and generally it is downy or hairy. Between these

surfaces lies a softer body, and in the pea the leaf is doubled upon its upper surface, so that the under one is made external. A leaf may be folded in more ways than one; but yet, whatever be the form of the fruit, it always results from the way in which the leaf was folded when it first budded. Sometimes, for instance, it forms a peach, and the hairy covering of its under surface becomes the soft and downy skin of that delicious fruit; the cellular texture of the pabulum, or soft substance between the two surfaces, absorbing a great quantity of sap, and swelling out as it grows, forms the fleshy substance; and the upper surface of the leaf, deprived of moisture by the thirstiness of this soft substance, is changed at length into a hollow stone, which defends securely the kernel or seed. The fruit, moreover, shows that it was formed of two valves, like a pea, for it may be divided; and, when diseased, it separates of itself.

F. That is exceedingly curious. Will you, mamma or papa, tell us more of this fruit which is so beautiful and delightful?

Mr. E. I will cheerfully do so. The Romans are said to have imported the peach from Persia; but whether it is a native of that country cannot be fully determined. In warmer parts of Asia it is very generally cultivated, and in many it requires no aid. America has it also, and in Europe it has long been highly prized. In the neighborhood of Paris this fruit is of excellent quality. The principal gardens for the supply of that city are at Montreal; and one tree sometimes covers sixty feet of wall from one extremity to the other.

F. Papa, how are peach-trees raised?

Mr. E. Those last referred to are always raised from the stone; and the facility of doing this has tended to the general diffusion of this fruit. 'From China to Peru,' man has raised it, and others like it, very soon after he has begun to enjoy the advantages of civilization. Security, however, is necessary to their culture. Western Syria is more fertile, because it is less disturbed, than any other part of that country, and to this 'the hills of Lebanon owe those fine terraces, in long succession, which preserve the fertile earth; those well-planted vineyards; those fields of wheat, raised by the industrious hand of the husbandman; those plantations of cotton, of olives, and of mulberries, which present themselves every where in the midst of the rocky steeps, and give a pleasing example of the effects of human activity.' A great service was rendered to a tribe in the interior of South Africa, when Burchell, the traveller, gave their chief a bag of fresh peach-stones, and told him that they would produce trees which would continue every year to yield, without further trouble, abundance of large fruit of a more agreeable flavor than any which grew in their country. Columella says, however, that the Persians sent the peach to Egypt to poison the inhabitants; and a species of apricot is called by the people of Barbary, 'Matza Franca,' or the killer of Christians. But culture is to fruits as it should be to children, making what are bad good, and the good better.

E. Ah, papa! I know what you mean. And I was just thinking, how I like apricots and nectarines.

Mr. E. They are both fine fruit, my dear. The nectarine, indeed, when of a good kind and properly cultivated, is superior to the peach; but of its history little is known. In Asia the former is very widely diffused, and it grows on the slopes of the barren mountains westward of China. The Persians call the apricot of Iran 'the seed of the sun.' In Japan, the apricot attains the size of a large tree; and it flourishes in such abundance upon the Oases as to be dried and carried to Egypt as an article of commerce. It is thought by some to be a native of Africa. The plum is still more widely diffused. It came originally from Asia and many parts of Europe, and it even grows wild in the hedges in some parts of Britain, though possibly it has found its way there from some of the cultivated sorts, and has degenerated. So early as the fifteenth century, various kinds appear to have been introduced to us from France and Italy. The Orleans probably came to us when we possessed the part of France from which it takes its name; the green-gage is called after the family by whom it was first cultivated here; and the damson, or damascene, is, as its name imports, from Damascus. The origin of the Washington, which is said not to be surpassed, is curious. The parent tree was purchased in the market of New York, towards the end of the last century. For several years it remained barren, till, during a violent thunder-storm, the whole trunk was struck to the earth and destroyed. A number of vigorous shoots were afterwards thrown out, all of which were allowed to remain, and finally produced fruit.

E. The storm was kinder to the plum-tree than another was some time ago. Don't you remember, mamma, the tree we saw on Sherwood Forest, which had been struck by lightning? Oh! there was not on it a leaf or a twig, and it looked quite solitary and wretched, like old Watkins, the mole-catcher, who now-a-days is the picture of misery.

Mrs. E. I recollect it perfectly, love. But we must not forget the cherry, which it is supposed we have had in England ever since the days of Henry VIII. Before the middle of the sixteenth century, cherries were hawked about in London just as they are still; and the commencement of the season was announced by some one carrying a bough or twig laden with the fruit. At some of the ruined Abbeys and baronial castles, cherry trees are found, but chiefly black ones, which have reached the height of sixty or eighty feet, and continue to produce great quantities of fruit. But here is that elegant little volume, 'The Amulet.' 'I will read you an extract from Dr. Walsh's Visit to Nicæa. He was at this time in the neighborhood of a Turkish town, called Serbandgee. 'We found ourselves in an elevated valley, embosomed in higher hills, with a magnificent lake below us. The hills were clothed with trees of an infinite variety of foliage covered with fruit — chestnut, walnut, plum, cherry, fig, apple, quinces, pears, and medlars — in such incredible profusion, as to be sufficient to supply the whole population of England; yet here there was no one to gather them. You may think it an exaggeration to say that these fruit

trees formed large forest-wood; but the luxuriance of vegetation in this country is such, that dwarf plants with us grow here to the size of giants. About mid-day, we stopped at a derven, or pass in the forest, where there is generally a small Turkish guard; attached to this was, as usual, a coffee-house, where we lighted our chiboques, and had some coffee. The coffee-house was under the shade of a large tree, covered with yellow fruit, the nature of which, as I had not seen anything like it before, I was curious to ascertain. Against the stem, I found a hanging ladder, which I climbed up; and after ascending forty steps, each one foot perpendicular, I found I had not got so high as the middle of the tree. The tree was a cherry-tree, producing an immense profusion of fruit, of a beautiful transparent amber color, and of the richest flavor. I brought down my hat full, and they sent us a basket full, for which we paid the value of about a penny to the man, for the trouble of gathering. I took away with me some of the stones, to try to propagate the kind at Constantinople, where it is unknown, as well on account of the delicious flavor of the fruit, as the beauty and magnificence of the tree, which could not be less than one hundred feet high.'

F. Papa, is not the olive something like the cherry?

Mr. E. It is. On the origin of it, the Greeks had a fable, which was not only pleasing but instructive. They said that Neptune, having a dispute with Minerva as to the name of the city of Athens, it was decided that whichever gave

the best present to mankind should have the privilege of conferring one. Neptune struck the shore, out of which sprang a horse; but Minerva produced an olive-tree; and therefore it was given to her, because peace, of which the olive is the symbol, is infinitely better than war, of which the horse was considered a type. The olive-branch of Noah you cannot forget. Some have supposed that the tops of the olive-trees might alone be visible from the place where the ark was then floating, though it is only a tree of moderate height; but if the dove saw a great number of other trees appear above the water, it was natural for it to repair to the olive-tree in preference to others, because there it had been accustomed to find shelter and food. With peculiar propriety the olive-leaf, or branch, was chosen by God as a sign to the patriarch of the abatement of the deluge, and from this, perhaps, it became the emblem of peace to various and distant nations. Captain Cook found that green branches carried in the hand, or stuck in the ground, were thus regarded by all the islanders, even in the South Sea. True piety has, also, been beautifully exhibited under this figure: —

'Oh! who could bear life's stormy doom,
Did not thy wing of love
Come brightly wafting, through the gloom,
Our peace-branch from above?

Then sorrow, touched by thee, grows bright,
With more than rapture's ray,
As darkness shows us worlds of light
We never saw by day.'

Mrs. E. I remember some travellers state that olive-trees are not always green, and that though

the fields, and indeed the whole face of Tuscany, are almost covered with them, they were greatly disappointed by the duskiness of their hue. Perhaps papa can suggest how it is that, notwithstanding this, we read so often in the Scriptures of the *green* olive-tree.

Mr. E. The word, my dear, so translated may be considered not only as descriptive of color, but of strength and prosperity. Thus Nebuchadnezzar says, 'I was at rest in my house, and *green* in my palace:' but here the word is very properly rendered flourishing, and this intimates that his empire was like a plant when it is green. Other instances of the same kind might easily be given. The leaves of the olive bear some resemblance to those of the willow, only they are more soft and delicate. The flowers are as delicate as the leaves, and come forth in June. At first they are of a pale yellow; but when each flower, the corolla of which is not divided, widens upwards and separates into four parts, the insides of them are white, and only the centre of the flower yellow. The fruit is first green, then pale, and, when it is quite ripe, black. Maillet says that the olive-tree thrives greatly in Egypt, and very commonly produces fruit as large as walnuts. Hasselquist states that he ate olives at Joppa which were said to have grown on the Mount of Olives, near Jerusalem, and that they were the best he had tasted in the Levant. He saw olive-trees in Galilee also, but none further than the mountain on which our Lord's sermon is supposed to have been delivered. They are found, however, in various parts of the earth.

E. Papa, how is olive-oil obtained?

Mr. E. The proper time for gathering olives is just before they are ripe; for, if delayed too long, the next crop is prevented, and the tree is productive only every alternate year. At Aix, in France, where the olive-harvest takes place early in November, it is annual; in Spain and Italy, where it is delayed till December or January, it takes place every second year. The quality of the oil also depends on gathering the fruit in the first stage of its maturity. Sometimes, as in the scriptures, we read of the trees being beaten, and at others of their being shaken: the former denotes the common practice of gathering by the owners of the olive-yards, the latter the method of the poor and the stranger, who might thus glean those that were left. But the best plan, it appears, is to pluck the fruit with the hand, and to complete the whole harvest, if possible, in a day. That the mucilage may be concocted, and the water allowed to evaporate, it is spread out, for two or three days, in beds three inches deep. The fruit is reduced to a pulp, put into sacks of coarse linen, or feather-grass, and subjected to pressure. The oil first expressed is the purest. In 1827, its importation into Great Britain amounted to about four thousand five hundred tuns. The Tuscans, however, were the first that exported it, and thus it obtained the name of Florence oil. The province of Suse, in Morocco, produces great abundance of what is said to equal in quality the best of this kind; and of the origin of a large plantation of olive-trees in the neighborhood of Messa, Mr. Jackson

gives the following singular account. 'I learnt from the viceroy's aid-de-camp, who attended me, that one of the kings of the dynasty of Saddia, being on his journey to Soudan, encamped here with his army; that the pegs with which the cavalry picketed their horses were cut from the olive-trees in the neighborhood; and that these pegs being left in the ground, on account of some sudden cause of the departure of the army, the olive-trees in question sprung up from them. I confess, while I acknowledged the ingenuity of the idea (for the disposition of the trees exactly resembled the arrangement of cavalry in an encampment), I treated it as fabulous: sometime afterwards, however, the following circumstance occurred, which induced me to think the story was not only plausible, but very credible. Having occasion to send for some plants for a garden which I had at Agadeer, or Santa Cruz, the foulah (gardener) brought, amongst other things, a few bits of wood, without any roots or leaf, about eighteen inches long and three in circumference, which he, with a large stone, knocked into the ground. Seeing the fellow thus employed, I asked him what he meant by trifling in that way. 'I am not trifling,' said he, 'but planting your promegranate-trees.' I began to take them out of the ground; but some persons who were near, assuring me that it was the mode in which they were always planted, and that they would (with the blessing of God) take root and shoot forth leaves the next year, I was at length prevailed on to leave a few in the ground, merely for experiment; and they certainly did

take root, and were in a fair way of becoming good trees when I left Santa Cruz.'

Mrs. E. It is worthy of remark, that all stone-fruits are formed in the same manner; and that the rough-coated almond belongs to the same class in nature, and originates in the same way, as the soft and delicate peach.

E. I should never have thought that, mamma. A nice, sleek, pretty-looking cat like ours, must be of quite a different kind to the hedge-hog that little Tom Hudson found the other day in the shrubbery.

Mrs. E. Very true, my dear; but the fact is as I have stated it. The soft intermediate part of the leaf is changed into coarse thready fibres, which form the external covering of the nut: the upper surface of the leaf, which in other cases forms a thin delicate skin becomes a hard woody nut; and the other surface the smooth skin with which it is covered. Some, indeed, think that the difference between the peach and the almond is very inconsiderable; and a curious fact is mentioned by the president of the Horticultural Society. The fruit of a sweet almond tree, which had been obtained from an almond-kernel, that had, when in flower, peach pollen applied, was sown, and produced a tree: this tree bore eight peaches, some of which were perfect, and the others burst at the centre when ripe, like almonds. The peaches were of a fine form and color; the flesh white, soft, melting, and of good flavor. This, if it does not show that an almond can always be changed into a peach, proves that it can be done by the pollen. The almond is, probably, a native of the western parts of Asia. It is mention-

ed as among the best fruits of the land of Canaan. It is now abundantly cultivated for its fruit in Italy, Spain, and the south of France; but in England chiefly for the beauty of its early flowers, which, appearing on the bare branches, led one of our poets to say,—

'The hope, in dreams, of a happier hour,
That alights on misery's brow,
Springs out of the silvery almond-flower
That blooms on a leafless bough.'

Now, Emma, though you have seemed quite astonished at the change of the almonds into peaches, you will not be surprised to hear that cocoa-nuts are included in the same class.

E. No, indeed, mamma! But as long as you and papa tell us — and oh, it is so kind of you! what is extraordinary, I shall never give up wondering. And I should like dearly to hear about the cocoa-nuts.

Mr. E. The cocoa-nut tree* grows to the height of seventy or eighty feet. The stem tapers from the bottom gradually to the top, without branch or off-set; but at the summit it shoots forth from twenty to thirty vast leaves, some of which are six or seven yards in length. These hang in a graceful tuft all round the crown of the trunk. When young and small, the leaves are entire; but as they lengthen they divide into narrow slips, each of which has a wiry rib running up the middle, and diverging from the *spinal* stalk of the leaf— as it may be called. Though strong at the point of contact with the tree, the weight of this enormous foliage would soon break

* Cocos nucifera.

it off; but, where it branches out, a cloth-like substance, called Aa, whose fibres run at right angles with each other, is formed, and invests the tree with its strong and needful intertexture, running also about twenty-four inches up the leaf, and affording it complete support. From among the junctures of these leaves with the head of the stalk spring branches of tendrils, on which grows the fruit, — a nut enveloped with a husk about two and a half inches thick, green on the outside, and composed of close tough fibres, which run lengthways from end to end, presenting an oval shape, rather angular at the sides.

F. The shell, too, papa, I remember, is hard and black, the kernel lining the shell is white, and it contains some milky water.

Mr. E. It does; and the ease with which the fruit is obtained is remarkable. Some travellers say: Being thirsty, we requested some cocoa-nut water, whereupon two or three of the natives ran to the nearest trees, which they climbed with surprising facility, by clasping the stems with their arms and pressing their naked feet against the bark; and thus these tall and branchless stems were apparently ascended with almost as much ease as they walked on level ground. Presently several fine nuts were brought to us, the husks of which the men tore off with their teeth; then, having punctured one end of the shell, we were each presented with a draught of this most delicious beverage for appeasing thirst in a tropical climate.'

Some trees will produce, at the same time, a hundred, each containing from half a pint to a

wine-quart of the liquor; and these noble fruits closely encircle the top of a stem, like a beaded belt, or coronet, beneath the pendent crest of plume-like leaves.

F. Papa, how does the lower part of the tree look?

Mr. E. The trunk is a bundle of fibres, closely connected by a cementing matter. Within two or three feet of the ground, these fibres spread forth into thousands of small roots, which insinuate themselves through the earth, and spread horizontally twelve or fourteen feet from the bole, in all directions. This cordage must be amazingly strong, for it supports the whole tree, with its bulk of stem, foliage, and fruit. The bark seems to be of little use in this species, as it generally rots off towards the ground at an early stage. Cocoa-nut stalks have been seen decayed through the heart, and others of which large portions of the outside had been cut away to a considerable depth, which yet continued to thrive and bear leaves and nuts. The timber, if these live faggots of well-packed fibres can be called timber, is of some value, being used for rafters in sheds, and cut into short lengths for fences; spears were formerly made of it. The leaves are turned to better account, being platted into mats, shaped into baskets, and occasionally manufactured into bonnets. The fibres of the husks are twisted into ropes and lines of various sizes, which are exceedingly strong. The shell of the nut is converted into drinking-cups, lamps, and other small vessels. The kernel, when scraped out of the shell, is either eaten raw, or,

being squeezed through the fibres of the husk, yields the milk, which is sometimes mixed with arrow-root, and a kind of pudding is compounded of both. The kernel also produces a valuable oil: to obtain this, it is first scraped into thin flakes, being ingeniously scooped out of the shell by means of a semicircular piece of flat iron, sharpened, and fixed upon the angular point of a sloping stool, on which the person sits, and turns the nut, open at one end, over this edge till the contents are cleared out. The sliced kernels are then put into a trough, or old canoe, where, in a few days, the oil drains from them, is carefully collected, put into bamboos, and corked up for use. This oil is called by the South Sea islanders *mori*, and has entirely superseded the candle-nut for lighting. After the better portion has thus been drained off, the residue is extracted by means of a press.

E. How are these trees planted, papa?

Mr. E. When the nuts are intended to produce others, they are hung, being quite ripe, on a tree. In about six months, a green leaf shoots out of one of the three holes at the smaller end. The nut is then put into the ground, to the depth of the shell, with the sprout upwards, when, from the other two holes, a pair of roots strike downward, and the plant is nourished by the decay of the nut till it can draw its entire sustenance from the soil; and such is its freedom of growth that there is scarcely a spot, however otherwise barren and unpropitious to vegetation, from which this stately plant will not spring up, with its diadem of beauty, and girdle of fertility. In about six years it begins to bear; the fruit is nearly twelve

months in coming to perfection. From the juice of the cocoa-nut the finest arrack of the East Indies is made.

Mrs. E. Now, Emma, I imagine your are quite satisfied that the metamorphoses of the vegetable world are not less amazing than those of the animal.

E. Quite, mamma. I knew a leaf was a very wonderful little thing; but I never should have thought of its being changed into a peach, an olive, or a cocoa-nut!

THE DESSERT.

'What a fine collection of early, yet full-ripe fruit, we have to-day!' said Mr. Elwood to his children: 'I see you, as well as Mamma and myself, enjoy it exceedingly. Frederick is, I think, fairly entitled to some, as a reward for the attention he is paying to his studies; Emma, too, may join him, for her progress is very satisfactory; and, as for my little rosy cheeked Edward, he tries to do as he is told, and promises well.

'"As Nature adapts her supplies to the course of the seasons," says St. Pierre, "cherries, plums, apricots, peaches, afford us, in the burning heats of summer, a supply of soft and refreshing fruits; while figs and mulberries give us a stock of what may be called saccharine and pectoral. These products are, in truth, transient, like the season which ripens them; but when, like the

sun, they forsake us, they are succeeded by others of almost equal attraction. Pears and apples are given to us in the latter part of the summer; and, when autumn veils the sun with his mists, the chestnut and the verdant oak afford us their mealy and substantial fruit; the olive, the almond, the walnut, produce their savory oils; while the vine affords, in the fermented juice of its grape, the most powerful of cordials. Lastly, the ash, the lime-tree, the willow, the elm, the beech, the oak, and a number of others, all of which have sheltered us against the summer heat by their delightful foliage, now supply us, in their branches and solid trunks, with roofs, with materials for the labor of the carpenter, and with fuel against the inclemency of winter.

'Fruit may, indeed, suggest to us much instruction. This cherry, for instance, contains what is amazing. The eatable part first serves the purposes of perfecting the seed or kernel, by means of vessels passing through the stone; and which in that part of a peach are very evident. When the kernel is perfected, the stone becomes hard, and the functions of these vessels cease; but the substance surrounding the stone is not thrown away as useless, for it now receives and retains to itself the whole of the sun's influence, and thereby becomes a grateful food for man. It ought to be remarked, moreover, that the intervention of the stone prevents the second use from interfering with the first.

'Variety, too, meets us at every step, as we contemplate the works of God. The seed, which is thus perfected in the cherry, reaches maturity

in other fruits by different means. In nuts, it is encased in a strong shell, and the shell itself is enclosed in a pulp or husk, by which the seed within is, or has been, fed; in grapes, oranges, and many kinds of berries, it is plunged and overwhelmed in a glutinous syrup, contained within a skin or bladder; in apples and pears it is imbedded in the heart of a firm, fleshy substance; and in strawberries it is pricked into the surface of a soft pulp.'

Mrs. E. Another instance appears in the general formation of fruits. How diversified is this! Sometimes the fruit is formed from a single flower; at others several carpels are joined together to form fruits, having different cavities or cells for seed. Indeed, the number of the latter implies the number of the fomer thus united, though there are some exceptions to this rule. The carpels consist of folded leaves: if these reach to the centre of the fruit, the cells will be complete; if they reach but half way, the centre will be hollow and empty; and if they be still less folded, they will spread out in growing, and the fruit, though composed of several carpels, will only have one cell. Of this kind the melon is an example.

E. I like melons, mamma, exceedingly.

Mrs. E. A melon, love, is the richest and most highly-flavored of all the fleshy fruits. It was freely used in early times, and has been long raised in our own country. Here and in France it is grown as a luxury, but in some parts of the East it is the chief necessary of life. Niebuhr, the celebrated traveller, says, 'Of pumpkins and

melons, several sorts grow naturally in the woods, and serve for feeding camels; but the proper melons are planted in the fields, where a great variety of them is to be found, and in such abundance that the Arabians of all ranks use them, for some part of the year, as their principal article of food. They afford, also, a very agreeable liquor. When the fruit is nearly ripe, a hole is pierced into the pulp, then stopped with wax, and the melon is left upon the stalk. Within a fews days after, the pulp is, in consequence of this process, converted into a delicious liquor.' To this Mr. Southey alludes when he says:

'Whither is gone the boy?
He had pierced the melon's pulp,
And closed with wax the wound;
And he had duly gone at morn,
And watched its ripening rind;
And now all joyfully he brings
The treasure now matured.'

Of melons there is a great variety, and the number is constantly increasing. In Persia twenty sorts are known; the finest grow in Khorasan. The fruit there is so large that two or three melons are a full load for a man. In some fruits the carpels are not only united, but soldered with the calyx; so that, when the blossom falls, the fruit is composed of them both, forming a single body. Of this kind are some with which you are well acquainted.

E. Oh, mamma! I know a great many: strawberries, raspberries, currants, gooseberries, oranges, pines, and ——

Mrs. E. I do not mean any of *them*, but apples

are of this description; and whenever you see an eye made by the remnants of the sepals, or leaves of the calyx, at the top of fruit, you may be sure it is thus formed; as are all whose seeds are pips.

Mr. E. Many of the better sort of English apples were probably at first introduced from the continent. The greater part of the names they bare are French, either pure or corrupted. The varieties at present known are considerably more than a thousand; and of late years they have been remarkably increased, by applying the pollen of one sort to the blossom of another. Frederick, do you remember a remarkable fact as to the falling of an apple?

F. Yes, papa; it is mentioned in the Life of Sir Isaac Newton; but I should like to hear it once more, and I think my sister has not read it.

Mr. E. In the twenty-third year of his age, he was sitting one day in his garden, thinking, perhaps, of motion and space, when an apple fell from a tree by his side. Now, that bodies have a tendency to fall towards the centre of the earth was already well known, as affecting all in the immediate neighborhood of our planet, and the philosopher, Galileo, had found out the rate according to which their speed is increased as they continue to descend; but no one dreamed of the gravitation, as it is called, of the heavens. The fall of the apple, however, now suggested the idea dimly to Newton's mind. For thus he reasoned: The same power which has drawn this apple to the earth, when detached from its

branch, would have drawn it from a position a thousand times as high; — wherever we go, we find this gravitation; even on the summits of the highest mountains its power is not diminished; — why may it not then reach to the moon, retain that planet in its orbit, and keep it revolving as it does round our earth? And, if the moon be retained in her orbit by a gravitation towards the earth, may not the earth and other planets which revolve round the sun, be retained in their orbits by a similar tendency towards that luminary? Proceeding with such considerations, he was at length the illustrious discoverer of the secret mechanism of the heavens.

E. How I should like to have seen the apple, if it had been in the British Museum! And then, papa, the apple that William Tell shot from the head of his son, when it was thought he could not do it, and would shoot his child instead, might be placed just by, like some of the fruits which are there in bottles.

Mr. E. I am glad, my dear, you remember that interesting fact. Pliny mentions 'apple-trees that will honor the first grafters forever;' but he little thought of the fame which would be enjoyed by the observer of an apple falling from a tree. We shall often observe important discoveries by accident; but that of Newton's was dependent on calculations long continued, by which his first thoughts were varied and established. Before, however, we pass from this fruit, it should be observed that cyder is produced from it, and that the counties where it is made lie somewhat in the form of a horse-shoe, round the

Bristol Channel: the best are, Worcester and Hereford on the north, and Somerset and Devon on the south. They are superior in appearance to those in which alone grain is cultivated. In the spring, extensive districts are covered with a profusion of flowers; and in autumn the fruit is beautiful. Some orchards occupy a space of forty or fifty acres; and the trees being at considerable distances, the land is also kept in tillage. The quantity of apples required to make a hogshead of cyder is from twenty-four to thirty bushels; and, in a good year, an acre of orchard will produce from twenty to twenty-five hogsheads.

F. Mamma, I have read somewhere of an apple which is very beautiful and tempting outside, but which is full of dust.

Mrs. E. You mean, my dear, the apple of Sodom. It is, in fact, a purple egg-plant,* of which the fruit is large and handsome. A species of fly† often attacks and punctures the rind; on which the whole fruit gangrenes, and is changed into a substance like ashes, while the outside is fair and attractive.

Mr. E. Perry, a liquor somewhat similar to cyder, is produced from pears; most of the fine sorts of which were obtained from the continent. Many of the names given them have been corrupted very strangely; and one of the finest French pears bears one which, in English, is called the *Good Christian Turk*, a description which is about as congruous as a *Good Christian Jew*. The Chinese, who cultivate fruit far more

*Solanum Sodomeum. † Cynips.

perfectly than the European gardeners, are said to have pears white in the inside, melting, fragrant, and of the enormous weight of ten pounds each. The fruit catalogue of the Horticultural Society mentions above six hundred varieties of the pear, and states that the newly-discovered Flemish kinds are of much more importance than the greater part of those which have been cultivated in Great Britain, and, when brought into use, will give quite a new feature to the dessert.

F. Are oranges, mamma, formed in the same way as apples and pears?

Mrs. E. No, my dear. The orange is a pulpy, not a fleshy fruit like those already mentioned; and pulp is a peculiar juicy substance situated inside the carpels. Those of the orange consists of the quarters into which the fruit may be divided when the rind is peeled off, and the seeds are imbedded in the pulp contained within them.

E. Oranges are very delightful. Whence, mamma, did we have them first?

Mrs. E. It is said they were imported into England by Sir Walter Raleigh, and that their seeds produced the orange-trees which were at Beddington, in Surrey, and attained the height of eighteen feet, while the stems were about nine inches in diameter, but which were destroyed some years ago, either by frost or from being placed in an inclosure. Orange and lemon trees have been cultivated in the open air in England; and, for a hundred years, they have been seen in a few gardens in the south of Devonshire, trained as peach-trees against the walls, and sheltered only with mats of straw during the

winter. The fruit of these is stated to be as large and fine as any from Portugal. Oranges are peculiarly adapted for transmission from one place to another. Foreign figs, dates, and grapes, must be dried; the tamarind is a liquid preserve; the guava must be made into a jelly; the mango has to be pulled before it is ripe, and to be pickled; and even the cocoa-nut becomes hard and indigestible. But the orange may be had fresh in every region of the world, and almost at every season of the year. Its aromatic oil and its rind preserve it from the effects both of heat and cold, while the acridity of the former keeps it from the attacks of insects. Most of the oranges and lemons intended for exportation are gathered while green; for if they were to become matured they would spoil. It is remarkable, too, that the trees from which the fruit is gathered when green, bear plentifully every year, while those on which it is suffered to ripen, yield abundant crops only on alternate years. It is calculated that 272,000,000 are annually imported, allowing about a dozen annually to every individual of the population.

F. Mamma, the orange-trees I have seen are small; are they always so?

Mrs. E. Oh, no, my dear. In Spain there are some old orange-trees forming large timber; in a convent at Rome, there is one, said to be six hundred years old, which is thirty-one feet high; and, at Nice, there was a tree, in 1789, generally bearing five or six thousand oranges, which exceed fifty feet in height and required two men to embrace it. The size greatly depends on the

age of the plant. The glory of the country eastward of the Rhone, too, is the orange, which, when full grown, is about twenty-five feet high. It is indeed a graceful tree. Its trunk and older branches are of a delicate ash color; its twigs of so soft a green that they almost appear transparent; its leaves are moderately large, beautifully shaped, of a fine healthy green, and shining on the upper sides, while the under ones are slightly downy; its little bunches of graceful flowers cast around a delightful fragrance — in the sweet oranges they are of a delicate white, and the more acid varieties are lightly marked with pink. The tree is, at the same time, and in all the stages of its bearing: here appear the pretty flowers — there the fruit is just set — close by, it is suspended in all the beauty of its maturity. No wonder that the imagination was excited by so lovely an object, and that fiction changed the oranges of the East into the golden apples of the Garden of the Hesperides.

E. I quite long to see them, mamma; and I am sure your eyes were quite bright when describing them.

Mr. E. Mamma seemed, indeed, Emma, quite as much pleased by the thought of them as you ever were by their taste; and I am sure, my dear little girl, when you were so ill they seemed as grateful as water to the traveller in the wilderness. Of the orange genus there are four distinct species; and of the lemon many varieties. There are large plantations of orange-trees at Silhet, in India, at which place the fruit often costs no more than one rupee per thousand.

E. I was just wondering, papa, how raspberries are formed.

Mr. E. The raspberry consists, my dear, of a considerable number of small fleshy carpels, all of which result from a single flower. The red and white varieties of this fruit are natives of Britain. Its flavor is very fleeting: to have it in perfection raspberries should be eaten, as I have often seen you eat them, Emma, from the bush.

E. But, papa, I like strawberries a great deal better.

Mr. E. They are certainly superior, Emma; and for this delicious fruit, of which there are many kinds, we are indebted to Louisiana and Virginia. By the way, the arctic berry, which grows from a bramble, in the wildest and most exposed parts of Lapland, sometimes offered to Linnæus the only food which he found in his perilous journey in those dreary regions; and of it he thus speaks: — 'I should be ungrateful towards this beneficent plant, which often, when I was almost prostrate with hunger and fatigue, restored me with the vinous nectar of its berries, did I not bestow on it a full description.' Dr. Clarke, too, appears to have been greatly indebted to a berry which is widely diffused, called the cloud-berry. A single berry grows on the top of a stem, and its appearance and effect he thus describes: —'Mr. Grape's children came into the room, bringing with them two or three gallons of the fruit of the cloud-berry, or *rubus chamæmorus.* This plant grows so abundantly near the river that it is easy to gather bushels of the fruit. As the large berry ripens, which is as big as the

top of a man's thumb, its color, at first scarlet, becomes yellow. When eaten, with sugar and cream, it is cooling and delicious, and tastes like the large American hautboy-strawberries. Little did the author dream of the blessed effects he was to experience by tasting of the offering brought by these little children, who, proud of having their gifts accepted, would gladly run and gather daily a fresh supply, which was as often blended with cream and sugar by the hands of their mother; until, at last, he perceived that his fever rapidly abated; his spirits and his appetite returned; and, when sinking under a disorder so obstinate that it seemed to be incurable, the blessings of health were restored to him, where he had reason to believe he should have found his grave. The symptoms of amendment were almost instantaneous after eating these berries.

F. Are all the berries formed like the raspberry you just described, papa?

Mr. E. No, my dear; even the strawberry is not properly so called, because it does not belong to the class of berries. It consists of a fleshy substance, formed by the expansion of the summit of the pedunculus, or stalk, in which the several parts of the flower are inserted. The small grains on its surface are so many little carpels, each of which contains a seed; and these, though dry, resemble the small fleshy spherical bodies which form the raspberry. The white conical substance which remains in the calyx of the raspberry, after the fruit is pulled off, resembles the fleshy substance of the strawberry; for they both result in the same way.

E. How strange that is! And are gooseberries and currants formed differently?

Mr. E. They are formed alike, but different from the raspberry. The fruits in which the seeds are promiscuously situated are classed by themselves; and among these grapes appear. The vine, however, deserves particular notice. It grew plentifully in Palestine, and was particularly fine in some of its districts; one of which has been thus celebrated: —

> 'In yonder vale, where Eshcol flows along,
> Behold, a mountain rising to the skies!
> Above it towers the sun—sublimely high;
> While his bright beams its lofty top makes bare.
> To its steep side the vine, luxuriant, cleaves;
> Tender in shoot, yet large in leaf, and high.
> Its purple fruit, delicious to the taste,
> Producing wine to cheer the heart of man,
> To heal the sick, and to support the weak—
> To comfort all——.'

The bunch of grapes which was brought by the spies to the camp of Israel astonished the people, and we are assured by travellers that, in the valley of Eshcol, there were bunches of grapes of ten and twelve pounds weight. One of them even states, that he was informed by a person who lived many years in Palestine, that there were bunches of grapes in the valley of Hebron so large that two men could scarcely carry one. The prediction of the lot of Judah, in the partition of the promised land, included abundance of vines, so hardy that a colt might be bound to them; and, in some parts of Persia, it was formerly the custom to turn the cattle into the vineyards after the vintage, to browse on the vines, some of which are so large that a man can hardly compass the trunks in his arms. The

same custom, too, appears to have prevailed generally in Lesser Asia. Galilee would now be a paradise were it inhabited by an industrious people, under an enlightened government. Vine stalks are to be seen here a foot and a half in diameter, forming, by their twining branches, vast arches, and extensive ceilings of verdure. 'A cluster of grapes, two or three feet in length, will give,' says Schutze, 'an abundant supper to a whole family.'

E. I should think, papa, a vineyard is very beautiful.

Mr. E. Not always, my dear; the hop-plantations of England are far more picturesque. In France, the vines are trained on poles, seldom more than three or four feet high; in Spain, poles are not used, but cuttings are planted, which, not being permitted to grow very tall, gradually form thick and stout stalks; in Switzerland and the German provinces, the vineyards are as uninteresting as those of France; but, in Italy, the vine surrounds the stone cottage with its girdle, flings its pliant and luxuriant branches over the rustic veranda, or twines its long garland from tree to tree; in Greece, the shoots of the vine are either trained upon trees, or supported, so as to display all their luxuriance; in Persia, they cause their vines to run up a wall, and curl over on the top; and, in some parts of the East, the stairs leading to the upper apartments of the harem are commonly covered with vines; a lattice-work of wood is often raised against the dead walls, for a vine or other shrubs to crawl upon; and not unfrequently appears

'the fruitful bough by a well;' for a vine may be seen covering the trelliswork surrounding it, and inviting the owner and his family to gather beneath its shade.

E. How delightful it would be, papa, for us all to be there? The grapes would be so rich, and the shade so agreeable! But I should not like it without you, mamma, Frederick, and Edward. No, our sweet little arbor, with the clematis just peeping in, would then be a thousand times better.

Mrs. E. I am glad you think so, dear. But you may yet see some remarkable vines. There is one, for instance, at Hampton Court, which covers a surface of 1694 square feet, and has seldom fewer than 2000 clusters on it every season. One year it had a still greater number; each weighing, on an average, a pound. Another, at Valentines, in Essex, extends over a still greater surface, and has a larger trunk; but it is not generally so productive, though sometimes it is not inferior. These are called Black Hamburgh vines. Much, however, depends on the cultivation of trees. 'The people of Nauplia,' Dr. Clarke says, 'were early renowned for the culture of the vine; they observed that those trees on which asses browsed were more abundant in their produce; this suggested the art of pruning; and, in consequence of their success, they formerly worshipped an ass's head as an idol.'

F. Why, that was another accident turned to good account, like Newton's apple

Mrs. E. It was so; but such cases are very numerous. We must not forget, however, that raisins are dried grapes, and that currants are those of a smaller kind. The mode of drying grapes is thus described in Laborde's account of Spain:—'In the kingdom of Valencia they make a kind of ley with the ashes of rosemary and vine branches, to which they add a quart of slaked lime. This ley is heated, and a vessel full of holes, containing the grapes, is put into it. When the branches are in the state desired they are generally carried to naked rocks, where they are spread on beds of the field artemisia, and are turned every two or three days till they are dry. In the kingdom of Grenada, particularly towards Malaga, they are simply dried in the sun, without any other preparation. The former have a more pleasing rind, but a less mellow substance; the skins of the latter are not so sugary, but their substance has a much greater relish; therefore, the raisins of Malaga are preferred by foreigners, and are sold at a higher price: to this their quality may likewise contribute; they are naturally larger and more delicate than those of the kingdom of Valencia.' What question was that, Emma, I saw you were about to ask?

E. Mamma, you have not said a word yet about the fig-tree. Will you be so kind—or, if you are tired, perhaps papa will tell us something about it?

Mr. E. The fig-tree, my love, is one of great interest, and, from your study of the Scriptures, it is naturally associated in your mind with the

vine. In the fructification of the fig there is something very singular. It has no visible flowers; for the fruit arises immediately from the joints of the tree, in the form of little buds, with a perforation or aperture at the end, but not showing anything like petals. As the fig enlarges, the flower comes to maturity in its concealment; and, in eastern countries, the fruit is improved by a singular operation. It is performed by suspending with threads, above the cultivated figs, branches of the wild fig, which are full of insects called cynips. When one of these has become winged it quits its house, and penetrates the cultivated figs for the purpose of laying its eggs; and thus it ensures the fructification by dispersing the pollen, and afterwards hastens the ripening by puncturing the pulp, and causing a dispersion or circulation of the nutritious juices. In France, straws dipped in olive oil are inserted to produce the same effect. Another fact is very remarkable. The fig-tree yields fruit through a considerable portion of the year. The first ripe figs are called boccore, and reach maturity about the latter end of June; though, as in other trees, a few ripe ones are produced before the full season. These few are probably of an inferior value, according to the language of the prophet Hosea: 'I found Israel like grapes in the wilderness; I found your fathers as the first ripe fruit in the fig-tree at her first time.' When the boccore approaches perfection, the karmouse, or summer-fig, begins to be found. This is the crop that is dried. And, when the karmouse ripens, in Syria and Barbary, there appears a

third crop, which often hangs and matures upon the tree after the leaves are shed.

Mrs. E. How extraordinary, too, is the banian-tree! * One described by Mr. Forbes had lost a considerable part by the high floods of a neighboring river, but what still remained was near two thousand feet in circumference, measured round the principal stem; the overhanging branches, not yet struck down, covered a much larger space; and under it grew a number of custard-apples, and other wild plants. The large trunks of this single tree amounted to three hundred and fifty; the smaller stems, forming into strong supporters, exceeded three thousand; and every one of them was casting out smaller branches, and hanging roots, in time to form trunks, and become the parent of a future progeny. According to the Hindoo superstition, the origin of the tree is ascribed to a saint, who, ages since, invoked a blessing from Brahma on a small sprig of banian-tree, which he stuck into the ground on this spot, and prayed that it might overshadow multitudes. It is, probably, some thousand years old, and the Hindoos regard it with great veneration. On sacred festivals they repair beneath its shade to worship their respective deities, and perform their ablutions in the surrounding stream. This magnificent pavilion was filled with a variety of feathered songsters, peacocks, and other birds; and crowded with whole families of monkeys, whose antics were very diverting; showing their parental affection

* Ficus Indica.

by teaching the young ones to procure their food, and exert themselves with agility in jumping from bough to bough, and then taking more extensive leaps, from tree to tree, encouraging them by caresses when timorous, and menacing them when refractory.

Mr. E. Sometimes fruit is formed by a collection of several fruits produced by different blossoms. The cone of a pine or fir-tree is an example; the flowers are separated from each other by what are called bractæa, which remain after flowering; they grow tough and hard, and enclose each of the fruits, as it were, in a case, and thus this little pyramid is composed of an aggregation of fruits, produced by as many different flowers, having each a single seed. Another instance is afforded by the pine-apple. This is not a single fruit, but is the result of the soldering together of a number of small fruits, collected on an axis, which is the stalk. These small fruits, being soft and fleshy, unite together; but traces of the different fruits are seen on the surface, each forming a small protuberance; the axis of the fruit terminates in a crown of leaves, which surmounts the whole. It is remarkable, too, that cultivation diminishes the quantity of seed: in the pine-apple it makes them fail completely, so that the plant can only be propagated by the crown, or by suckers. In the centre of the pine-apple, the vacant cells may be perceived in which the seeds have perished, and in which they are lodged in the wild pine-apple.

Mrs. E. The mulberry should also be mentioned: it is, in fact, an aggregation of several

different fruits, proceeding from as many different flowers, though it wears the same appearance as the raspberry, which is the result of different carpels belonging to the same flower.

Mr. E. A species of mulberry is cultivated in Japan for the manufacture of paper, and hence it is called the paper-mulberry.* For this purpose it is raised in beds, as osiers are cultivated with us for the use of the basket-maker and the cooper. When the leaves have fallen off, that is, about the month of December, the shoots are cut down, divided into lengths of about three feet, bound into bundles, placed upright and close together in a copper, and boiled till the bark is completely loosened from the wood. Should they be dry before being subjected to boiling, they are prepared for that operation by maceration in water for twenty-four hours. After the rods are cold, the bark is divided lengthwise by a knife, stripped off, and dried for use. When about to be used, it is put into water till it is so much soaked that the external and colored part of the bark can be separated. That being done, the bark is sorted, the strongest being set apart for the best and whitest paper, and the weaker for that of inferior quality; while of the refuse a very coarse brown paper is made. The sorted bark is then boiled till it becomes tender, that is, till it easily separates with the fingers, and then it is washed for a longer or shorter time, according to the quality of paper wanted. If strong writing-paper, the washing must be

* Broussonetia papyrifera.

moderate; but, if the color is to be very delicate, and the texture soft and silky, the washing must be more prolonged. When properly washed, it is taken to a table, and there reduced to a pulp, by beating with wooden mallets. When sufficiently reduced, it is brought to the requisite consistency with water; rice-starch, and the mucilaginous infusion of manihot-root,* are added by way of size; and then the sheets of paper are formed, one by one, upon a table, collected into heaps, and pressed by a weight.

Mrs. E. I now recollect another circumstance. The bark of the paper-mulberry furnishes fibres for ropes, and it can even be formed into a kind of cloth. M. la Rouverie affirms that he procured a beautiful vegetable silk from the young branches of this tree; cutting the bark while it was in sap, and then beating it with mallets, and steeping it in water, he obtained a thread from the fibres, almost equal to silk in quality, and this was woven into a cloth, whose texture appeared as if formed of that material. The women of Louisiana obtain a similar production from the offshoots of the mulberry; these are gathered when about four or five feet high. The bark is stripped and dried in the sun; it is then beaten to get rid of the outer part, which falls off, leaving the inner bark entire. This is again beaten to make it still finer, after which it is bleached in dew. It is then spun, and various fabrics are made of it, such as nets and fringes; and sometimes it is woven into cloth. The finest cloth

* Hibiscus manihot.

among the inhabitants of some of the South Sea islands is made of the bark of this tree.

F. Where, papa, may we find the finest fruit? Is it not much better in other countries than it is here?

Mr. E. In some respects, my dear, foreigners have the advantage; in others, it is decidedly ours. It is true the market place of Thoulouse is remarkably splendid. Millions of peaches and nectarines may be seen there, as a recent traveller remarks, of a size that would strike an English gardener with astonishment, some of which measure ten inches in circumference; and there are millions of every fruit and every vegetable found within the temperate zone. But I agree with him in thinking that, notwithstanding the size and beauty of the fruit found in the more southern countries, it does not equal, in flavor and mellowness, the same fruit produced in a choice garden in England. The finest melon reared in England, by artificial heat, is indeed an indifferent fruit compared with the melon of Grenada or Valencia; and the choicest hot-house grape, though much excelling the grapes of France, is yet far inferior to the muscatel of Malaga or Alicant. But I speak of fruits ripened both in England and on the continent by the sun, and I assert that these are found in greater perfection in England than in any other country. And with him I may add, 'the enormous peaches of Languedoc are neither so mellow nor so high flavored as the best English peach; for, before the inside becomes thoroughly ripe, the outer parts lose their freshness and flavor. I have no

where tasted pears equal to the jargonel, such as I have eaten in England: the ribstone pippin is not equalled in any continental market; and, as for strawberries, I'll back my own little garden against the world.'

Mrs. E. I quite agree with you, my dear; and wish our children to imbibe your ardent love of our 'father-land.' We will not deny to other countries their claim to admiration; they have their advantages — but England — England, 'with all its faults,' shall be our home.

A SUMMER EVENING.

'How delightful it is now, mamma!' said Emma, as one fine summer evening the tea equipage was removing: 'it has been quite a sultry day, but now it is so cool and pleasant; and, after such a ramble as we have had, what can be so agreeable as coffee and tea?'

'You will be surprised, perhaps, my dear, when I tell you,' replied Mrs. Elwood, 'that to a Turk both our tea and coffee would be quite unpalatable.'

'What a strange creature he must be, then, mamma!' said Emma.

'Might he not say the same thing of you?' rejoined Mrs. Elwood. 'Habit produces on him and you its peculiar effect. *You* like tea sweetened with sugar, and softened with milk, but

he never takes anything of this kind, but coffee, without milk or sugar, which is as black, thick, and bitter, as soot; and, when a traveller gave some tea in your way to a Turk, he describes his distress at the mawkish mixture as quite ridiculous. He stated, however, that the ladies of the harem requested to taste the tea also, but, when a specimen was sent, they soon burst into loud fits of laughing at the extraordinary stuff, and it was said they liked it as little as the other sex.'

E. Well, mamma, they shall have *their* way, and I, if you please, will have mine; but where did we first obtain tea?

Mrs. E. It is a native of China or Japan, and, probably, of both. It was used among the natives of the former from time immemorial, and has been the constant theme of their poets, from the age of Confucius. But the leaf was first imported into Europe by the Dutch East India Company, in the early part of the seventeenth century, though it was not till the year 1666 that a small quantity was brought over from Holland to this country by Lords Arlington and Ossory. Now the quantity we consume is immense.

F. Can you tell us, mamma, how it grows?

Mrs. E. It is produced from seeds, which are laid in rows four or five feet asunder; but, so uncertain is their vegetation, that it is necessary to sow seven or eight seed in every hole. The ground between each row is always kept free from weeds, and the plants are not allowed to grow higher than to allow of the leaves being conveniently gathered. The first crop of leaves

is not collected until the third year after sowing; and when the trees are six or seven years old, the produce becomes so inferior that they are removed to make room for others. But papa will be so kind as to assist my description.

E. Oh, papa, what color are the flowers?

Mr. E. They are white, and somewhat resemble the wild rose, which grows so plentifully in our hedges; the flowers are succeeded by soft green berries or pods, each containing from one to three white seeds. The leaves are gathered from one to four times during the year, according to the age of the tree, but most commonly there are three gatherings, which take place about April, June, and September. In the first, the leaves are small, tender, and unfolded, but of the most delicate color, and aromatic flavor, and with the least portion of either fibre or bitterness. The persons employed do not pull the leaves by handfuls, but pick them one by one, and are careful not to break them; and, though the process seems tedious, they gather from four to ten or fifteen pounds a day. In the second, the leaves are of a dull green color, while those in the third are of inferior value.

Mrs. E. I have heard that the most celebrated tea in Japan is that which grows near Udsi, a small village close to the sea. Here is a delightful mountain, whose climate is peculiarly favorable to the plant; it is therefore enclosed, and watched most attentively. Its produce is gathered with the greatest care, and is escorted by the superintendent of the mountain, and a strong guard, to the emperor's court, and reserved for the use of

the imperial family. As, too, the tea-shrub often grows on the rugged banks of steep mountains of dangerous access, the Chinese make use of a singular stratagem. They irritate the monkeys, which generally frequent such spots, and these creatures tear off the branches, and throw them down in revenge. The branches are then immediately collected, and the leaves stripped off.

E. Cunning as the monkeys are, mamma, they do not know that the Chinese are more so. I wonder though that they have not found out the tricks. But I should like to know what is done with the leaves after they are gathered.

Mr. E. They are put into wide shallow baskets, and placed in the air, wind, or sunshine, for some hours. They are then put on a flat cast-iron pan, over a stove heated with charcoal. About half or three quarters of a pound of leaves are thus heated at once, stirred about quickly with a kind of brush, and then hastily swept off the pan into baskets. The next process is that of rolling, which is done by men carefully rubbing them between their hands; after which the leaves are again put, in larger quantities, on the pan, and exposed to heat, but only enough to dry them effectually, without danger of scorching. When this is done, the tea is placed on a table and carefully picked, and every unsightly or imperfectly dried leaf is removed, in order that the sample may look as well as possible. For some finer sorts the heated plates are not used, but the leaves, one by one, are carefully rolled into balls, with the hands. It is, however, an error to suppose, as some do, that the color of green tea is given to it by sheets

of copper on which it is dried, since this metal is never used in its preparation.

E. Does not coffee grow like tea, papa?

Mr. E. Oh, no, my love; it is the seed contained in a berry produced by a moderate-sized tree,* which grows erect with a single stem, to the height of from eight to twelve feet, and has long undivided slender branches bending downwards; these are furnished with evergreen opposite leaves, not unlike those of the bay-tree. The blossoms are white, setting on short foot-stalks, and resembling the flowers of the jasmine. The fruit which succeeds is a red berry, like a cherry, having a pale, insipid, and somewhat glutinous pulp, and enclosing two hard oval seeds, each about the size of a common pea. One side of the seed is convex, while the other is flat, having in it a little straight furrow; and, when growing, the flat sides are towards each other. These seeds are covered with a membrane.

Mrs. E. The appearance of a coffee-plantation, during the seasons of flowering, which does not last longer than a day or two, is very interesting. In one night the blossoms expand so profusely as to appear like trees in England when a snow-storm has come at the close of autumn, and loaded them while full of foliage. The seeds are known to be ripe by the dark red color of the berries, and, if not then gathered, they will drop from the trees. 'When the Arabian cultivator,' says Mr. Edwards, 'sees that his coffee is ripe, he spreads large cloths under his trees, which he shakes, from time to time, to make the ripe cher-

* Coffea Arabica.

ries fall. He never pulls one grain of coffee with the hand, whatever appearance it may have of maturity. He considers none as ripe but such as fall on lightly shaking the tree.' The berries are afterwards spread upon mats, and exposed to the sun's rays until perfectly dry, when the husk is broken with large heavy rollers, made either of stone or of wood. The coffee, thus freed from its husk, is again dried thoroughly in the sun, that it may not be liable to heat when packed for transportation.

F. Where does coffee grow best, papa?

Mr. E. In Arabia and other parts of the East. That called Mocha is considered the best. It is, however, cultivated in the West Indies. There the gathering is different to the mode just described. Negroes are set to gather such of the berries as are sufficiently ripe; and each one is provided with a canvas bag, having an iron ring, or hoop, at its mouth, to keep it always open; and the bag is slung round the neck, so as to leave both hands at liberty. As often as it is filled, the contents are transferred to a large basket placed to receive them. When the trees are in full bearing, an industrious man will pick three bushels in a day, and each bushel will yield ten pounds weight of coffee. The husks are separated from the seeds by mills. Coffee has also to be roasted for use.

Mrs. E. The time in which coffee was first used in the western parts of Europe is uncertain. The traveller, Pietro della Valle, writing from Constantinople in 1615 to a Roman, informed him that he should teach Europe in what manner the

Turks took what he called '*Cahué;*' but Purchas was also 'a pilgrim' at the time Valle wrote, and he thus describes what he called '*Coffa:*' 'they drink it as hot as they can endure it; it is as black as soot, and tastes not much unlike it; good, they say, for digestion and mirth.' The celebrated Thevenot, in 1658, gave coffee after dinner; but it appears to have been not at all inviting, and to have been considered as the whim of a traveller. Ten years afterwards, a Turkish ambassador at Paris made it very fashionable. So early, however, as 1652, it was known to us; for an English merchant engaged a Greek servant, who, knowing how to prepare it, opened a house to sell it publicly; and I happen to have, among my papers, the following copy of his hand-bill: 'The vertue of the coffee-drink, first publiquely made and sold in England, by Pasque Rosee, in St. Michael's Alley, Cornhill, at the sign of his own head.'

E. He had a better head than many, mamma; though his was nothing, after all, to yours and papa's; yet it was a little conceited to make a sign of it. How strange it would have been if Simpkins, at the New Inn, had done so, instead of putting up that *splendid* painting of the Swan and Two Necks. But you said, some time ago, that I liked sugar in my coffee and tea; and I should be glad to hear something about that.

Mr. E. Sugar, my dear, is the produce of a reed or cane,* which terminates in leaves or blades, whose edges are like that of a fine saw. The body of the cane is strong, brittle, and, when ripe, of a

* Arundo saccharifera.

fine straw color inclined to yellow: it contains a soft, pithy substance, which yields a copious supply of juice, of a sweetness, it has been said, the least cloying and most agreeable in nature. The distance between each joint of the cane varies according to the nature of the soil: in general it is from one to three inches in length, and from half an inch to an inch in diameter. The length of a whole cane depends on circumstances: in strong lands, richly manured, it sometimes measures twelve feet from the stole or root to the upper joint: the general height, however, without the flag part, is from three feet and a half to seven feet; and, in very rich lands, it has been known to put forth upwards of one hundred suckers, or shoots. The canes are ordinarily ripe in from ten to fifteen months, and, when cut, are taken to the mill.

E. What is done with them then, papa?

Mr. E. The juice of them is expressed by passing them between two iron cylinders, or rollers: then it is boiled with lime-water, which causes a thick scum to rise; the liquor is afterwards let off below, and is reduced, by evaporation, to a small quantity, when it is suffered to chrystalize by standing in a vessel having many holes at the bottom, imperfectly stopped, so that the syrup may drain off. The product thus obtained is what we call raw, or moist sugar; and, to change it into loaf-sugar, it is dissolved in water, and purified either by bullock's blood or the white of eggs, when the clear liquor is again evaporated, and, poured into moulds, becomes what was required. Still it wants to be whitened; the mould is therefore inverted, and its open base

being covered with clay, through which water is made to pass, this, slowly trickling through the sugar, carries off what discolored it.

E. And how, papa, do they make sugar-candy?

Mr. E. It is only the regular crystals obtained by slow evaporation; and barley-sugar is sugar melted by heat, and afterwards formed with models of the shape it bears.

Mrs. E. I never think of the sugar-cane without pitying the enslaved Africans who are compelled to cultivate it. This appears to expose them to the most toilsome drudgery and severe treatment. The earth was cursed for the sin of man; but, had it been equally affected, the natives of the Torrid Zone would have felt it more than the rest of their species. Unwearied labor and the sweat of the brow had thus been pre-eminently theirs. But we have adverted before* to that provision of the Creator by which disadvantages are compensated; and here we may observe a most interesting instance. The same glowing atmosphere that renders long-continued labor so arduous, lessens greatly the need of it, by giving to the soil with little culture much more fertility than laborious tillage will impart in temperate climes. Many nutritious fruits, grateful to the taste, and well adapted to the support of man, either grow spontaneously, or, when once planted, require scarce any further toil, but yield a constant and copious supply of food. To doom him, then, to incessant labor in such circumstances, is an act of oppression, in defiance of

* 'Art in Nature,' p. 237.

the purposes and provisions of the great Lord of all.

E. I shall never forget, mamma, those lines of Cowper's you taught me, in which he says —

> 'Slaves cannot breathe in England; if their lungs
> Receive our air, that moment they are free;'

and where he wishes that they may be so every where. But I fear we tire you, or else, perhaps, you could describe some of those trees which yield fruit without labor.

Mr. E. There is the plantain,* which rises with a stalk, about five or six inches in diameter at the surface of the ground, but tapering upwards to the height of fifteen or twenty feet. The leaves, which are in a cluster at the top, are very large, being about six feet long and two feet broad; the middle rib is strong, but the rest of the leaf is tender, and apt to be torn by the wind. The leaves grow with great rapidity after the stalk has reached its proper height. They come out from its centre, and are rolled up at their first appearance; but when they are advanced above the stalk, they expand and turn backwards. It is said that their growth may almost be discerned with the naked eye; and if a fine line is drawn across, level with the top of the leaf, the leaf will be nearly an inch above it in the course of an hour. The spike of the flowers rises from the centre of the leaves to the height of about four feet. At first, the flowers are enclosed in a sheath of a fine purple color; but, as they come to maturity, that drops off. The

* Musa paradisiaca.

fruit is about an inch in diameter, eight or nine inches long, and bent a little on one side; it is at first green; as it ripens it turns yellow, and is filled with a pulp of a luscious sweet flavor. The spikes of fruit sometimes weigh upwards of forty pounds.

Mrs. E. There is also the banana,* which is widely diffused through tropical climes. Its fruit is of the shape of a cucumber, about four or five inches long, and of a highly grateful flavor. Its leaves are two yards long, and a foot broad in the middle; they join to the top of the body of the trees, and frequently contain in their cavities a great quantity of water, which runs out, on a small incision being made in the tree at the junction of the leaves. Its growth is very rapid. Eight or nine months after the sucker is planted, the banana begins to form its clusters of fruit, and these may be collected in the tenth and eleventh months. The whole labor of cultivation which is required for a plantation of banana is to cut the stalks laden with ripe fruit, and to give the plants a little nourishment, once or twice a year, by digging round the roots. A spot of scarcely more than a thousand square feet will contain from thirty to forty banana plants. A cluster produced on a single plant often contains from one hundred and sixty to one hundred and eighty fruits, and weighs from seventy to eighty pounds; but, reckoning the cluster at forty pounds, such a plantation would produce more than four thousand pounds of nutritious substance. The ripe fruit is preserved, like the fig, by being dried in the sun, and is an agreeable

* Musa sapientum.

and healthy aliment. Meal is extracted from the fruit, by cutting it in slices, drying it in the sun, and then pounding it

F. What kind of taste has the fruit, mamma?

Mrs. E. Some of the varieties are said to possess an excellent flavor, surpassing the finest pear; and others are compared to a choice reinette apple, when kept through the winter. The banana has frequently produced its bunches of yellow fruits in hot-houses in this kingdom; and it appears probable that there will be as little difficulty in ripening the fruit as that of any tropical tree whatever.

E. I wish, mamma, we had some ripe now; how pleasant they would be! But here people can work without being so tired as they are where the plantains and bananas grow, and where — but, papa, I do n't recollect any more.

Mr. E. There is the cocoa-nut tree, of which you have heard, and also the bread-fruit tree. When the seeds fail, which is the case in the Friendly Isles, the fruit grows to a prodigious size; when the seeds are perfected, it is in a great measure at the expense of the fleshy part, whose place they occupy, and the fruit is consequently inferior, both in size and flavor. This tree grows to the size of an ash in America, and is not unlike that tree in form and the color of its bark. The branches affect an upright position. The leaves are much like those of the fig, but more deeply indented, besides growing to a far greater size, some being a foot and a half long. Its appearance is very stately and luxuriant. The fruit is egg-shaped, and sometimes measures

twenty-two inches in its shortest, and twenty-five in its longest, circumferences. The rind is smooth, green, and marked with hexagonal specks. Under this skin lies the pulp, which is eaten; and within that a fibrous core, containing the seeds. The tree is propagated by scions springing from the root of the old stock. These are either suffered to remain and grow up in a clump, or are transplanted singly. They require to be carefully attended to: the ground must be kept clear from weeds for some time, and also well fenced from the hogs, who devour the plants greedily whenever they can light upon such dainties. Bread-fruit trees are cultivated almost entirely on the low grounds, rarely thriving on the mountain sides, or very near the sea. They retain perennial verdure, and bear four crops of fruit in the year.

F. Have they many uses, like some other trees?

Mr. E. The manifold bounty of Providence is remarkably manifested in giving this valuable product of a soil not copious in variety of plants, to the people of the islands of the Pacific. It supplies them with food, raiment, and timber; each in its kind abundant and excellent. Their canoes are hollowed out of its trunk, or framed from its planks; the beams, rafters, and flooring of their houses, are hewn out of its substance; and it also furnishes a good pitch, in the gum which exudes from holes bored into its stem. Of the bark a very useful description of cloth is prepared, and with this, indeed, they would want no other. The fruit is a delicate and wholesome

substitute for bread; being very nutritious, and of a sweet and pleasant flavor. Various modes of dressing this food are in use among the natives. The skin being pared away, the pulp is most generally split and roasted, or rather baked, in earthen ovens, upon and under hot stones; and it is often thus cooked with part of a hog, a fowl, or a fish. When taken out, it is soft and mealy, much resembling, in color and taste, fine sponge biscuit. The natives frequently beat or squeeze it in their hands, and dip the pieces in salt water, when they eat it. This fruit, in fact, is the principal support of the people, who seldom make a meal without a large proportion of it. They call it *miory*.

E. And does the tree always yield fruit?

Mr. E. No; there are more than three months out of the twelve when the fruit is either not to be obtained, or very scarce. To compensate this inconvenience, the inhabitants preserve great quantities of that which is quite ripe in pits, about four feet deep, and of the same width. These pits are carefully lined with grass, and then with the leaves of the tii plant, which give an agreeable flavor to the preserved fruit. The latter, being cleared of the green coating, and split, is thrown together on a heap, and covered with leaves for from twenty-four to forty-eight hours, as the state of the weather may be. The pile is then opened, and the cores of all the split pieces being extracted, these are again laid together; after which the whole undergoes a process of fermentation, and becomes soft. It is then stowed in the pit, covered with grass, and

the grass pressed down with stones. The bread-fruit, thus cured, is taken out of these store-pits, from time to time, as it may be wanted, in the state of a sour paste, when it is dressed according to every man's taste. Though the natives, from habit, are fond of it this way, the food is difficult of digestion, and by no means wholesome.

Mrs. E. You have passed a pleasant evening, I am sure, my dears; and I think you have also learned much. We, too, have an advantage besides that of our pleasure in gratifying and instructing you. By and by, *you* will be more than listeners, and must contribute to others as well as receive from them; for so Mrs. Hannah More has said: —

> 'Our intellectual ore must shine,
> Not slumber, idly, in the mine.
> Let education's moral mint
> The noblest images imprint;
> Let taste her curious touchstone hold,
> To try if standard be the gold;
> But, 't is thy commerce, *conversation*,
> Must give it use by circulation;
> That noble commerce of mankind,
> Whose precious merchandize is *mind*!'

But here we must pause. How gloriously the sun is setting! — and hark! the blackbird and thrush are pouring forth their evening song.

THE AGED TREE.

'I stood for some time, this morning,' said Mr. Elwood, 'to gaze once more at that noble forest-tree in the lane, which has so long continued beautiful and unmutilated. It stands on the side of the waste, shading and sheltering the neighboring cottage, having escaped the hedger's bill, and the woodman's axe, and defied the fury of a hundred storms. It is not so gigantic as some are, but it deserves regard from the vegetable powers which have existed and still continue in its trunk. At some very distant period, the bole appears to have lost, either by accident or design, its leading shoot; and, in consequence, has thrown out several branches at each side; three still remain, which have now grown into trees, existing in full vigor, and presenting a beautiful appearance. It is, indeed, a fine specimen of an oak, with all the twistings, furrows, and irregularities, which this tree, when it grows freely, generally exhibits, stretching its arms to the sun with a graceful dignity. Its age I cannot tell. In young trees, the rings of the wood often enable us to judge, but, in old ones, these marks are not a sufficient guide. Still, it must have been long — very long — since it was a sapling, and first put forth its light green foliage.'

'It is indeed, a fine object!' said Mrs. Elwood; 'Emma and Frederick, you should observe it.'

'I have done so, again and again, dear mam-

ma,' said Emma, 'for my brother showed it me — I don't know how long since.'

'I am glad Frederick was so observant,' rejoined Mrs. Elwood, 'and so anxious, too, that you should partake the pleasure he enjoyed. Such qualities should always be discovered.'

'And they will never go unrewarded,' added Mr. Elwood; 'kindness always recompenses the heart which cherishes it, and the approval and attention of others will not always be withheld. This morning, for instance, I propose that we should give you an account of the oak, as a reward for this act. What say you, dears?'

'We shall think it a very kind one,' said Emma, while Frederick looked delighted.

'In the Scriptures,' said Mr. Elwood, 'we read much of the oak; but there are several words which have been thus rendered by our translators although, in other passages, they have rendered them the plain-tree, teel-tree, &c. Sometimes, it is thought, too, they have confounded it with the terebinth. This is an evergreen, of moderate size, but having the top and branches large in proportion to the body: the leaves resemble those of the olive, but are of a green color, intermixed with red and purple: the twigs that bear them always terminate in a single leaf: the flowers, which are purple, are like those of the vine, and grow in bunches: the fruit, of the size of juniper-berries, hangs in clusters, and is remarkably juicy. The tree abounds near Jerusalem, and in Cyprus. Josephus says, moreover, that, six furlongs from Hebron, a very large terebinth was shown, which the inhabitants of the

country believed to be as old as the world; and Eusebius assures us that, in his time, this terebinth, under which it is said Abraham entertained the angels, was still to be seen, and was held in great veneration. The benediction of Jacob on Naphtali, is rendered by some, 'Naphtali is a spreading terebinth, producing beautiful branches.'

Mrs. E. In the history of Greece, we meet in very early times with the famous oracle of Jupiter, that is, a place where it was said his voice was heard, at the oaks of Dodona. And, in Gaul and Britain, we find the highest regard paid to this tree and its misletoe, under the direction of the Druids — the oak-prophets, or priests. They thought the misletoe was sent from heaven as a sign that God had chosen the tree on which it grew; and, though rarely found, it was treated, as soon as discovered, with great ceremony. They styled it, indeed, the curer of all ills, and, having prepared under the tree feasts and sacrifices, brought to it two white bulls, whose horns were then, for the first time, tied. After this, the priest, attired in a white robe, ascended the tree, and, with a golden pruning-hook, cut off the misletoe, which was received in a white sheet. Victims were then sacrificed, with many prayers for the blessing of God on his own gift. And, says Parkhurst, 'Is it possible for a Christian to read this account without thinking of Him who was the desire of all nations, of the man whose name was the BRANCH, who had indeed no father on earth, but came down from heaven; was given to heal all our ills; and, after being cut off

through the divine counsel, was wrapped in fine linen, and laid in the sepulchre, for our sakes?'

Mr. E. Venerated as the oak was for the superstitious rites just mentioned, the value of this tree was unknown to our remote forefathers. At an early period, in the history of Britain, it was prized chiefly for its acorns. When the Saxons held sway, the fattening of hogs upon them in the forests was so important, that, at the close of the seventh century, King Ina enacted laws for its regulation. The failure of the acorn-crop is even mentioned as one of the principal causes of famine. One of the most vexatious acts of William the Conqueror, in turning the whole of the forests into hunting-grounds, was that of restricting the people from fattening their hogs; and this grievance King John was called upon to redress at Runnymede, where his assembled subjects compelled him to sign Magna Charta.

E. Why, papa, was it such a grievance?

Mr. E. Because swine's flesh was the principal food of most nations in the earlier stages of civilization. Up to a recent period, large droves of hogs were fattened on the acorns of the New Forest, in Hampshire, under the guidance of swine-herds, who called them together every night by the sound of a horn.

F. Papa, that was, I think, the place were William Rufus was killed, as he was hunting, by an arrow which Sir Walter Tyrrell shot at a stag, but which, glancing from a tree, killed the king.

Mr. E. It was, my dear. It is not well for us to have all we wish. The tract of land which

William desolated for his personal amusement was fatal to several of his family. In that forest, his son Richard, and a nephew of the same name, were killed, while engaged in the chase; and his son, as you have mentioned, lost his life on the same spot, and when employed in the same diversion. A fine oak is one of the most picturesque of trees. It has the appearance both of strength and duration. It rears its head against the blast, and, while others are twisted from the action of the wind, it retains its form uninjured. Its twisted branches, too, add greatly to its beauty, and, remarkable enough, to its utility. When it stands alone, it is a spreading rather than elevated tree; in that situation, the timber is also said to be more compact and firm, and the crooked arms are better adapted for ship-building, than when the trees are close together. In thickly-planted groups, the oak will rise to the height of eighty or a hundred feet before it begins to decay; and, in some of the choicer trees, forty, fifty, or even sixty feet may be found without a single lateral branch, and at the same time, of considerable size. These are as well adapted for beams and planking as others are for crooked timbers, and therefore, to secure a proper supply for maritime and domestic purposes, it is desirable to have them in both situations.

Mrs. E. Some oaks have grown to an immense size. Among the ancient trees of France, none, perhaps, is more remarkable than that in the burial-ground of Allonville. It measures, above the roots, upwards of thirty-five feet round, and, at the height of a man, twenty-six feet. A

little higher up, it extends to a greater size, and, at eight feet from the ground, enormous branches spring from the sides, and spread outwards, so that they cover a vast space with their shade. The height of the tree does not answer to its girth: the trunk, from the roots to the summit, forms a complete cone; and the inside of this is hollow throughout the whole of its height. Several openings, the largest of which is below, afford access to this cavity. All the central parts having been long destroyed, it is only by the outer layers of the alburnum, and by the bark, that this venerable tree is supported; yet it is still full of vigor, adorned with abundance of leaves, and laden with acorns. The lower part of the hollow trunk has been transformed into a chapel, of six or seven feet in diameter, carefully wainscoted and paved, and guarded by an open iron gate. Above and close to the chapel is a small chamber, containing a bed; and, leading to it, there is a stair-case, which twists round the body of the tree. At certain seasons of the year, service is performed in this chapel. The summit has been broken off many years, but there is a surface, at the top of the trunk, of the diameter of a very large tree, and from it rises a pointed roof, covered with slates, in the form of a steeple, which is surmounted with an iron cross, that raises itself, it is said, in the middle of the leaves, like an antique hermitage above the surrounding wood. The cracks which occur in various parts of the tree are, like the fracture whence the steeple springs, closely covered with slate, which, by replacing the bark, doubtless contributes to its

preservation. Over the entrance to the chapel, an inscription appears, which states that it was erected by the Abbé du Détroit, curate of Allonville, in the year 1696; and over the door of the upper room is another, dedicating it 'To our Lady of Peace.'

F. I should like to visit the chapel-oak exceedingly; but are no trees of this kind famous in England?

Mrs. E. There are several, my dear. The celebrated Fairlop oak, in Hainault Forest, Essex, is said to have measured, at three feet from the ground, about thirty-six feet in circumference, and the extremities of the branches gave a circle of three hundred feet. At Oakley, in Bedfordshire, the seat of the Marquis of Tavistock, there is an oak, now in perfect health, which contains about five hundred and twenty-seven cubic feet of timber, and the branches overspread a space of five thousand eight hundred and fifty superficial feet of ground. There are also many others, in the parks of Welbeck and Woburn, of great size.

E. Is the oak in which Charles the Second concealed himself after the batttle of Worcester still to be seen?

Mr. E. No, my dear; and though several trees were raised from its acorns, the race seems now to be lost. The oak-apple, which is still worn by some of our rustics on the twenty-ninth of May, in commemoration of that event, is worthy our attention. It is usually as large as a walnut, or small apple, which is not quite round. The skin is smooth, and tinged with red and yel-

low, like a ripe apple ; and, at the base, there is, in the earlier part of the summer, a calyx, or cup, of five or six small, brown, scaly leaves ; but these fall off as the season advances. If you cut an oak-apple transversely, you will perceive a number of oval grains, each containing a grub, and imbedded in a fruit-looking fleshy substance, having fibres running through it. As these fibres, however, run in the direction of the stem, they are best seen when the gall is cut vertically, and this also shows — what is very extraordinary — that each fibre terminates in one of the small grains, like a vessel for carrying nourishment.

F. What insect, papa, produces these galls ?

Mr. E. It is a cynips, whose mechanism is very remarkable. It is provided with a needle in a sheath, so peculiarly constructed that the needle can be extended to double the length of the animal itself; thus it forms a nest for its offspring, while the young, in the same manner, pierce their way out of the vegetable shell which has been their protection. But the dwelling is not always made in the same way. One kind of apple or gall, inhabited only by one grub, is hard and woody on the outside, resembling a little wooden ball, of a yellowish color, but internally it is of a soft, spongy texture. The latter substance, however, encloses a small hard gall, which is the chamber of the insect. Galls of this kind are often found in clusters of from two to seven, near the extremity of a branch, but always separate.

Mrs. E. An excrescence grows on the catkins

of the oak, having the appearance of a straggling bunch of currants, or bird-cherries. The galls resemble currants which have fallen from the tree before they are ripe, and seem not to differ from those formed on the leaves of the oak and other trees, which are usually of a green color tinged with red. The oak from which the nut-galls of commerce are procured* is very common in Asia Minor; but Europeans were long with very little information on the subject, although the galls were so extensively used. It is a shrub seldom exceeding six feet in height, and was introduced by M. Olivier to France, where it is cultivated as a garden shrub, and grows well in the open air. The best galls, which are used for ink and for dyeing, come from Aleppo, and of these a hundred and seventy-four tons were imported into the United Kingdom in 1827.

E. I think, mamma, we are very much indebted to these little creatures; though I did not know before that we owed them anything. Perhaps papa could not wear black, if it were not not for them. Are there many insects of this kind?

Mrs. E. In Spain, in some parts of France, and along the Mediterranean coasts of Africa, there is found a small species of oak,† which nourishes large quantities of a small insect, ‡ which, being gathered, forms an article of commerce called Kermes. The inhabitants of the province of Murcia gather them, as their only mode of subsistence. Latreille has united this insect to the

* Quercus infectoria. † Quercus coccifera.

‡ Coccus ilicis.

cochineal family, which it resembles, not only in form, but in producing a scarlet dye. Till the discovery of the cochineal insect, the Kermes was the only substance used in dyeing scarlet, after the disuse of the shell-fish that produced the Tyrian purple, now called scarlet, of the Romans. In England, and other places, the cochineal is now generally used for this color.

F. What is the misletoe, papa, that the Druids were so fond of, and which the villagers like to have hanging up in their cottages at Christmas, when they deck them so gaily with the holly, and its scarlet berries?

Mr. E. It is a parasitical plant; that is, one of those which are produced on the trunks, branches, or any other parts of vegetables, and which, in some instances, will not grow in the ground. The misletoe called viscum album, for example, is an evergreen shrub, and grows in great perfection on apple-trees. No one has ever yet succeeded in making it take root in the earth; but, if the berries, when fully ripe, are rubbed on the smooth bark of almost any tree, they will adhere closely, and produce plants the following winter. But, Frederick, how do you think we obtain cork?

F. I am sure I do not know, papa; but I will try to remember, if you inform us.

Mr. E. From a species of oak,* which is not so large as the common one. It is a broad-leaved evergreen, well known even to the Greeks and Romans: the latter, indeed, used it not only as we do, for stopping bottles, but for floats to their nets and fishing-tackle, and for buoys to their an-

* Quercus suber.

chors. We read, too, that Camillus had, on one occasion, a life-preserver of cork under his dress. The cork is the bark which the tree pushes outward, as is common to all trees, but here the outer bark is of larger quantity, and more speedily renewed. When removed, there is below it an inner bark; and from this the cork is re-produced in the course of a few years, while the tree is said to grow more vigorously, and to live longer, than if the cork were not removed. The first time the cork is taken off is when the tree is about fifteen years old; but the crop is thin, hard, full of fissures, and, consequently, of little value; and the second, which is removed about ten years after, is also of inferior quality. The operation is afterwards repeated about once in 8 or 10 years; the produce being greater in quantity, and superior in quality, every time.

F. In what way do they take it off, papa?

Mr. E. They cleave the bark lengthways, at certain intervals, down to the crown of the root with an axe, having a handle which terminates in a wedge; and a circular incision is then made from each end of the previous cuts. The bark is then beaten, to detach it from that beneath, and it is lifted up by the wedge, taking care not to injure the inner bark. The bark is afterwards divided unto convenient lengths, and then is flattened, and slightly burned, to contract the pores. From about the twenty-third year, the tree continues, for about a century and a half, to yield good cork every tenth year. The best sort comes from Portugal and Spain. The Spaniards cover the walls of their houses with it, like wainscoting,

which not only makes them warm, but very dry; and the peasantry lay broad planks of it at their bed-sides, as we do carpets: they also burn it, to make what painters call Spanish black. The Egyptians formerly made coffins of cork, lined with resin, which preserved the bodies for a long time.

E. Do they build houses with oak, mamma?

Mrs. E. It has been frequently used for such purposes, love. In Scotland, the roofs are generally of oak, which, before the trees were cut down, almost to extermination, in the lowland countries, was very generally in use. The parliament-house, in Edinburgh, has a fine roof, which is principally of oak; and I remember how much gratified I was at the sight of the application of this timber, when I visited the Baronial hall of Darnaway Castle. It was erected by Randolph, Earl of Moray — the friend of Bruce — when he was Regent, for the reception of the numerous vassals, who attended his court. After all the changes it must have undergone, it is still a noble monument of ancient magnificence, and hospitality, and is certainly the most perfect specimen of a Baronial hall in Scotland. The roof is supported by couples and rafters of massy oak, having an exceedingly fine appearance. The length of the hall is eighty-nine feet, its breadth thirty-five feet, and its height originally about thirty feet. Here stands the earl's hospitable board of thick oaken plank, resting on six pillars, and curiously bordered and indented; and near it is his oaken chair, on which are coarsely carved his arms, and the emblems of his office. In

this splendid building, when he came with his numerous retinue, for the purpose of hunting, the ample table was spread, and wine and wassail prevailed; and, at night, in the simplicity of that age, the floor was strewed with rushes, and there the earl and his companions reposed together. The oak employed in our men of war has led to their being called 'the wooden walls of old England;' and in memory of the defence they have afforded, the freedom of cities has been presented to distinguished individuals in highly-ornamented boxes of heart of oak.

E. And is that all, mamma, that you and papa are inclined to tell us? — I see you are just beginning to move.

Mrs. E. It is, my dear; and I hope you will spend the remainder of the day as pleasantly as you have passed a part of the morning.

THE ENIGMA

'I HAVE found a puzzle for you, my dears,' said Mr. Elwood to his children, as he entered the room where they were seated with thier mamma.

'Where, where, papa?' was the immediate inquiry.

'It is here,' said their father, as he laid his right hand on the table.

'Then it cannot be alive,' said Emma.

'You are mistaken, love,' replied her father,

'for it actually has life; and though this one may never do any good, yet to some of its ancestors we owe far more than I can pretend to describe. In addition to a hundred things which tend to domestic comfort, it has done much for the fine arts, assisting the production of the sweetest sounds; and presenting to the eye scenes and persons with whom imagination only was previously acquainted.'

Frederick and Emma thought for some time, but confessed they knew not what it could be; when Mr. Elwood showed them a little cone he had picked up in the shrubbery — the fruit of the fir-tree.

'O papa!' said Emma, 'is it only that? It has life, however; but then how do you make out the hearing and seeing?'

'Quite easily, love,' replied her father; 'fir-wood, so soft and sonorous, seems to have been preferred by the ancients, as well as the moderns, to every other kind, for the construction of musical instruments; and of it those parts of the harp, lute, guitar, harpsichord, and violin, on which their tone chiefly depends, are still made. And then, as it is said to be more durable even than oak, and does not warp or shrink, it was used by painters more than any other, before the use of canvas became general. Several of Raphael's pictures are painted on boards of this wood.'

'Ah, papa, I see now!' said Emma. 'I never thought you would be *fast*; but will you sit down and tell us all about it, as you did about the oak?'

'I have not the slightest objection,' said Mr. Elwood, as he took his seat in his easy chair, and

thus proceeded: — 'The cone, you perceive, is a tough, woody seed-vessel, which consists of the general receptacle, with a number of hard scales attached to it. When the fruit is matured, these scales lie on each other, like the tiles of a house; covering the seeds or nuts so completely, as to appear like one undivided body. In this state the cone hangs on the tree during the winter, and protects what is enclosed; but as soon as the warm weather comes, the scales begin to shrink and separate, leaving openings for the ripe seeds to escape. Sometimes a number of cones happen to burst at the same moment, and then the noise can be heard at a considerable distance.'

E. Why, papa, any one just under the trees would be startled, and not know whence the sound came, and he would look like — like — I should think, Alfred Melville did, when you told him to touch the bell at St. Paul's, as it was about to strike the quarters, and went off bomb — bomb — bomb!

Mr. E. Very likely, my dear, though he laughed heartily directly after. — In the Scriptures we often read of the fir-tree; thus the Psalmist says, 'As for the stork, the fir-trees are her house;' and a state of prosperity is indicated by the declaration of Ephraim, 'I am like a green fir-tree.' The only native one is the Scotch fir,* which grows plentifully throughout the Highlands. When planted in a grove, the trunk becomes tall and naked; but it puts forth numerous branches in open, sunny places. It is said to live sometimes to the age of four hundred

* Pinus sylvestris.

years. The wood, which is called red deal, is very smooth and light. The bark will tan leather; and, in years of scarcity, it is dried, ground into powder, and made into bread, by the people in the North of Europe, where it is also found. The Highlanders dig up the roots and divide them into small splinters, to burn instead of candles; for they contain a great quantity of resin, and easily take fire.

Mrs. E. The larch* is a native of the Alps and Appennines, where it sometimes attains the height of nearly two hundred feet. It, however, thrives well in Britain; and as it grows more rapidly, and also in more varied soils, than the common pine, it is perhaps better adapted for general cultivation. In the south, it attains an immense height; some single beams of larch, employed in palaces and public buildings of Venice, being said to be one hundred and twenty feet long. I have seen in the plantations of the Duke of Athol, and other proprietors in Perthshire, some larches at least a hundred feet high. The alternation of hill and dale in that country — exhibiting scenes of uncultivated magnificence contrasted with others adorned by skilful cultivation — with the general opening of the glens, and exposure of the surface to the south — afford the larch a situation something like its native spot; for though some fast-growing trees have been planted at the same time, the larch overtops them all; and in summer, arrayed in its foliage, which is of a bright clover-green, it looks like an obelisk of beryl. The larch sheds its leaves, and

*Pinus larix.

is probably saved by that means from those keen blasts of the early spring that prove destructive to pines. Thus stripped, it is an ornamental tree, for the trunk is generally straight, tapering gradually to a point; the branches, which are rather small in proportion to the tree, taper up in the form of a perfect cone; and the whole is of a lively brown, streaked with a golden color.

Mr. E. Larch, like other things, has its advantages and disadvantages. Its quality seems not to depend so much on the maturity of the tree, and the slowness of its growth, as that of the pine; as a fishing-boat built of larch only forty years old, has been found to last three times as long as one of the best Norway pine. It is not, however, so buoyant, or so elastic, and it is more apt to warp; but it is more tough and compact, and it approaches nearly to being proof against water and fire; so that, before a larch beam was ever completely charred on the surface, one of pine, or of dry oak, would be in a blaze. Still it is heavier to transport, and harder to work; and thus the introduction of this most safe and durable timber is prevented. The Norway pine* yields the white deal, the wood employed for so many useful purposes; and it is from the sap of this species that pitch, tar, common resin, and turpentine, are procured.

Mrs. E. Before we proceed, I will read you an interesting fact from the Travels of Dr. Clarke: — 'Before our arrival at Skale,' he says, 'the noise of roaring waters again announced the vicinity of a cataract. We were in the

* Pinus abies.

midst of a gloomy forest; but all at once the dark scenery of the surrounding woods opened upon such a view of the Ljusna, as no pen can describe: it burst upon us in all its terrific grandeur; the whole tide, collected from all its tributary lakes and rivers, throughout its course from the Norwegian Alps, in one vast torrent, clamorously foaming and rushing to the Bothnian Gulf. A bridge, constructed of whole trunks of fir-trees, divested only of their bark, stretched across this furious torrent, to the distance of one hundred yards; presenting one of the most picturesque objects imaginable. Above this bridge the river is a quarter of a mile broad; and, growing wider as it recedes from the eye of a person here placed, it is distinctly divided by promontories, projecting from its sides until they almost meet, and covered with tall trees; thereby forming straits which connect it with other seeming lakes, equally beautiful, beyond them, and which appear more remotely terminated by a ridge of mountains, closing the prospect. But, in this amazing spectacle, all is freshness and animation; the utmost liveliness, and light, and elegance, exhibited by the distant sheets of water, combined with all the energy and tremendous force of a cataract, making the bridge upon which the spectator stands shake under his feet, as if it were rocked by an earthquake.'

F. How grand — how beautiful, mamma! Can you think of some other trees?

Mrs. E. The cedar* is a large and majestic tree, rising to the height of thirty or forty yards,

* Pinus cedrus.

and some are from thirty-five to forty feet in girth. It is a beautiful evergreen, possessing leaves something like those of the rosemary, and distils a kind of gum, to which various qualities are attributed. The leaves of the tree are said to spread upwards into beautiful little tufts; the whole upper surface of the branch, which droops in a graceful curve, has the appearance of velvet, while the fruit hangs downward: it grows like cones of the pine-tree, but it is longer, harder, fuller, and not easily separated from the stalk. The wood is very valuable; it possesses a strong aromatic smell, and is reputed to be incorruptible. Of this, some of the most celebrated erections of antiquity were constructed. Thus we read that 'Solomon raised a levy of thirty thousand men out of all Israel; and he sent them to Lebanon, ten thousand a month, by courses; and he had threescore and ten thousand that bore burthens, and fourscore thousand hewers in the mountains. And he covered the temple with beams and boards of cedar. And he built chambers against it, which rested on the house, with timber of cedar. And the cedar of the house within was carved with knops and flowers: all was cedar; there was not a stone to be seen.' But the forest of cedars, once so famed on the mountain of Lebanon, has now disappeared; only a few trees remain — the memorials of former glory and of the mutability of all things earthly.

F. Will you tell us, papa, if you please, what is meant when the cedar is spoken of in the Scriptures?

Mr. E. Sometimes, my dear, it illustrates the

power of God; thus it is said, "The voice of the Lord is powerful; the voice of the Lord is full of majesty; the voice of the Lord breaketh the cedars; yea, the Lord breaketh the cedars of Lebanon. He makes them also to skip like a calf; Lebanon and Sirion like a young unicorn.'* How sublime is this! At the voice of God, the mighty tree which braves the tempest is broken; he speaks and the mountain on which it grows trembles, then leaps like the young of the herd when buoyant with joy, and skips and bounds like the swiftest of creatures! Isaiah in denouncing divine judgments on the mighty of the earth in their pride and arrogance, exclaims, 'The day of the Lord of hosts shall be upon all the cedars of Lebanon that are high and lifted up, and upon all the oaks of Bashan.'† And the prosperity of the pious is exhibited by an allusion to this tree, 'The righteous shall grow as the cedar in Lebanon.'

E. Oh, dear papa, I wish we knew all these things as well as you! How much more pleased should we be with the Bible — and how much more should we know about it!

Mr. E. You would, my dear; but, if you will ask me when any difficulties arise, I shall be glad to assist in removing them. Many specimens of the cedar of Lebanon are mentioned as having reached a great size in this country. In 1779, for instance, a remarkable one was blown down at Hendon Place, in Middlesex. It was seventy feet high; the branches covered a space one hundred feet in diameter; the trunk was sixteen

* Psalm xxix. 4. † Isaiah ii. 13.

feet in circumference at seven feet from the ground, and twenty-one feet at the insertion of the great branches, twelve feet above the surface. The average circumference of the ten principal limbs, or branches, was twelve feet. Some assert that it was planted by the hand of Queen Elizabeth. The precise spot where it arose is said to be marked by a handsome cedar now growing. In the Hindoo principality of the Kumaoon, the cedars are of an enormous size. Some of them have measured twenty-seven feet in circumference at four feet from the ground, and one hundred and eighty feet in height.

Mrs. E. A species of the cypress is called the white cedar,* and grows to a considerable size. The cypress is supposed to be more durable than cedar itself. The doors of St. Peter's Church, at Rome, formed of this material, showed no signs of decay, when, after the lapse of eleven hundred years, they were taken down to be replaced by gates of brass. To preserve the remains of their heroes, the Athenians buried them in coffins of cypress; and the chests or coffins of the Egyptian mummies are usually of the same wood. Some have contended that of this the ark of Noah was made. A singular species, called the cypress of Louisiana, grows with its roots in water, and is principally found on the banks of the Mississippi, whose shores are shaded by its magnificent foliage. The circumference of the trunk is nearly thirty feet; and to enable it to resist the floating masses of ice, which, at the breaking up of the winter season, descend in

* Cupressus thyoides.

great quanties from the northern lakes, several large protuberances act as buttresses, evidently designed to protect the base; while, upwards, at the height of six feet, the trunk is sensibly diminished. The heads are round and smooth, having neither leaves nor branches; and, therefore, cannot be considered as shoots. They are, in fact, ice-breakers.

F. That reminds, me, mamma, of several things you have mentioned. How delightful it is to think that God cares for the cedar!

Mr. E. It is, my love; and I will mention to you presently another remarkable instance of his providence. We must, however, first refer to the products of the trees we have mentioned. The common pine yields turpentine, which is obtained by cutting into the living tree: tar is also procured from it, and 'the process,' says Dr. Clarke, 'is very simple; and, as we have often witnessed it, we shall now describe it, from a tar-work which we halted to inspect upon the spot. The situation most favorable for this process is in a forest near to a marsh or bog; because the roots of the fir, from which tar is principally extracted, are always the most productive in such places. A conical cavity is then made in the ground (generally in the side of a bank, or sloping hill), and the roots of the fir, together with logs or billets of the same, being neatly trussed into a stack of the same conical shape, are let into this cavity. The whole is then covered with turf, to prevent the volatile parts from being dissipated, which, by means of a heavy mallet, and a wooden stamper, worked separately by two

men, is beaten down, and rendered as firm as possible above the wood. The stack of billets is then kindled, and a slow combustion of the fir takes place, without flame, as in making charcoal. During this combustion, the tar exudes; and a cast-iron pan being at the bottom of the funnel, with a spout which projects through the side of the bank, barrels are placed beneath this spout, to collect the fluid as it comes away. As fast as the barrels are filled, they are bunged, and ready for immediate exportation. From this description, it will be evident that the mode of obtaining tar is by a kind of distillation; the turpentine, melted by fire, mixes with the sap and juices of the fir, while the wood itself, becoming charred, is converted into charcoal. The most curious part of the story is, that this simple method of extracting tar is precisely that which is described by Theophrastus and Dioscorides; and there is not the smallest difference between a tar work in the forests of Westro-Bothnia, and those of ancient Greece. The Greeks made stacks of pine; and, having covered them with turf, they were suffered to burn in the same smothered manner; while the tar, melting, fell to the bottom of the stack, and ran out by a small channel cut for that purpose.'

Mrs. E. Turpentine is often distilled that essential oil may be produced, and what is left is a brownish mass, which is the resin of commerce. The bark of the larch-tree contains also a considerable portion of the bitter called tannin, which, mixed with the gluey part of the skins of animals, changes that into a substance not solu-

ble in water; and thus it is useful in tanning — the process of changing raw hides into leather. But papa has just handed me a volume which relates what is very singular. The northern slopes of the Alps, and some of the mountains of Germany, abound in pines; and the Rhine, and the Danube, are well adapted for conveying the timber to the lower districts, where it is valuable. The mode of doing this is very curious, and is thus described by the author of an interesting volume: — 'A little below Andernach, the little village of Namedy appears on the left bank, under a wooded mountain. The Rhine here forms a little bay, where the pilots are accustomed to unite together the small rafts of timber floated down the tributary rivers into the Rhine, and to construct enormous floats, which are navigated to Dortrecht (Dort.), and sold. These machines have the appearance of a floating village, composed of twelve or fifteen little wooden huts, on a large platform of oak and deal timber. They are frequently eight or nine hundred feet long, and sixty or seventy in breadth. The rowers and workmen sometimes amount to seven or eight hundred, superintended by pilots, and a proprietor, whose habitation is superior in size and elegance to the rest. The raft is composed of several layers of trees placed one on the other, and tied together: a large raft draws not less than six or seven feet of water. Several smaller ones are attached to it, by way of protection; besides a string of boats, loaded with anchors and cables, and used for the purpose of sounding the river, and going on shore. The domestic econ-

omy of an East Indiaman is hardly more complete. Poultry, pigs, and other animals, are to be found on board, and several butchers are attached to the suit. A well-supplied boiler is at work night and day in the kitchen; the dinner-hour is announced by a basket stuck on a pole, at which signal the pilot gives the word of command, and the workmen run from all quarters to receive their messes. The consumption of provisions in the voyages to Holland is almost incredible, sometimes amounting to forty or fifty thousand pounds of bread, eighteen or twenty thousand pounds of fresh, besides a quantity of salted meat, and butter, vegetables, &c., in proportion. The expenses are so great that a capital of 3 or 400,000 florins (about $150,000) is considered necessary to undertake a raft. Their navigation is a matter of considerable skill, owing to the abrupt windings, the rocks, and shallows of the river; and, some years ago, the secret was thought to be monopolized by a boatman of Rudesheim, and his son.'

Mr. E. I remember another instance. The following passage from Planche's 'Descent of the Danube,' gives a description of the method of floating timber on a branch of that river; and the practice appears to be common in Germany: 'At the mouth of the Erlaf, is a rechen, or grate, where the wood collects that is floated down this stream from the forests in the neighborhood of Maria-Zell, in the Steyermark, near which it takes its rise. It is customary in Germany to place one of these gratings at the mouth of any tributary stream, or in the bed of any river where

a line of demarcation is drawn naturally or artificially between two kingdoms, two provinces, or even two parishes; so that the branches and trunks of trees blown down by high winds, and swept away by inundations into the current, should not be carried beyond the frontiers, or boundaries, of the state or property to which they belong, and which derives from them no inconsiderable portion of its revenue.

'The timber, also, regularly felled by the woodcutters, is thrown thus carelessly on the mountain streams of Germany, and floats down to the rechen, or grate, where it is afterwards collected by its owners, who are thus saved the trouble and expense of land-carriage; and the drifting property is protected from plunder by the severity of the laws relating to it.'

F. When will you tell us, papa, what you mentioned about Providence?

Mr. E. Now, my dear. Greenland is the most northern tract of land lying between Europe and America. All its hills, except where the rocks are smooth and perpendicular, are covered with eternal ice and snow, which have also, in the course of time, filled all the elevated plains, and many valleys. To give you an idea of the cold there, I will read you an extract from the journal of Egede, the missionary. The date is January 7, 1738. 'The ice and hoar-frost reach through the chimney to the stove's mouth, without being thawed by the fire in the day time. Over the chimney is an arch of frost, with little holes, through which the smoke discharges itself. The doors and walls are as if they were plastered

over with frost, and, which is hardly credible, beds are often frozen to the bedstead. The linen is frozen in the drawers. The upper eider-down bed, and the pillows are quite stiff with frost, an inch thick, from the breath. The flesh barrels must be hewn in pieces to get out the meat; when it is thawed in snow-water, and set over the fire, the outside is boiled sufficiently, before the inside can be pierced with a knife.'

E. Oh, dear papa, I hope they have good large fires in that cold country!

Mr. E. No large timber grows in Greenland.

E. Poor creatures! what can they do for fires and houses?

Mr. E. That is a question which I expected, Emma; and I am glad I can answer it to your satisfaction. Though God has denied this frigid rocky region the growth of trees, he has bid the streams of the ocean to convey to its shores a great quantity of wood, part without ice, but most part with it, and to lodge itself betwen the islands. Thus there is wood to burn, and also timber to roof the houses of the Greenlanders, to erect their tents, to build their boats, and to shaft their arrows, by which they must procure their maintenance, clothing and train-oil, for warmth, light, and cooking. Among this wood, are great trees of various sorts, torn up by the roots. It is generally supposed that they come from Asiatic Tartary or Siberia, where the wild mountain torrents, swollen by the rains and floods, carry away whole pieces of land with the large trees upon them, which are plunged into the great rivers, and then carried out to sea. From thence they are driven

with the floating ice, by the easterly current, that comes by Spitsbergen, and conducted between Iceland and Greenland to the east side, round Statenhook, into Davis's Straits. How does this illustrate the psalmist's saying: 'Stormy wind, fulfilling his word.'

F. I am glad you thought of that story, papa; it is so interesting — so wonderful!

Mr. E. It is, my dear. Thus God, who cares for the tree of which you heard, cares for the Greenlanders.

THE THREE REGIONS.

'Our ride to-day,' said Mrs. Elwood, 'has presented us with a variety of objects; and I was particularly struck by the contrast between the spots that were fertile and those that were almost unproductive. What a change, too, may we observe in the air! The morning so bright and promising, has been succeeded by a dull and chilly evening.'

'Your remark, my dear,' said Mr. Elwood, 'has wafted my thoughts, in a moment, to a far distant spot; and I have been musing on the peculiar circumstances of Ætna, the far-famed burning mountain of Sicily. It is divided into three districts, or regions, each having its characteristic differences. They have distinct climates, corresponding with the gradations of ascent, and divided naturally into the torrid, the temperate, and

the frigid. The mountain, however, has been usually divided according to other differences; and thus we have described to us the fertile region, the woody region, and the barren region.'

'How I should like to see them!' said Emma; 'would not you, Frederick dear?'

'I think I should, Emma,' said Frederick: 'but papa is sometimes so kind as to let us hear about curious things which we are not likely to see; and perhaps he will now.'

Mr. E. The fertile region extends, my dears, fifteen miles from the city of Catania, whence the traveller usually begins his journey, and from which part the ascent commences. The surface of this region is reckoned at upwards of two hundred and twenty square leagues. It abounds in pasture-grounds, orchards, and fruit-trees, of great and rich variety; and there the vine especially flourishes. The next advance is to the woody region, which begins about three miles above the latter place, and extends upwards of eight or ten miles. The vegetation of this part is said to decrease as you advance, the trees gradually diminishing in size, till they become comparatively dwarfish and insignificant. This region is estimated at from seventy to eighty miles in circumference, with a surface of about forty or fifty square leagues, forming a girdle round the mountain of vivid green, composed of oaks, beeches, and other trees, in a soil of vegetable earth. The climate is here most agreeably mild, the air is cool and reviving, and every breeze is filled with delicious odors. It reminds us of the scene in the

Antediluvian world, which Montgomery has so beautifully described:

> 'So pure! so fresh! — the woods, the sky, the air! —
> It seemed a place where angels might repair,
> And tune their harps, amidst these tranquil shades,
> To morning songs, and moonlight serenades.'

E. It must, indeed, be beautiful, papa; is any thing else interesting?

Mr. E. Yes: there is a curious snow grotto. The snow which is drifted from the higher parts of the mountain, is stopped, by a wall erected for the purpose, a little above the grotto, whence it is thrown down by two openings, and is protected from the heat of summer by a thick crust of lava, which forms a natural ceiling to the cave. Snow is exported from this receptacle in large bags, into which it is put, after being wrapped in leaves; and, thus preserved, it has the appearance of transparent crystal. The knights of Malta hire this, and other grottos of a similar description, for the use of their island; hence snow becomes an important article of trade, the nature of the climate always occasioning a large demand. As the desert region is approached, vegetation becomes thin and small. Wintry blasts now sweep along a wild and desert path. Here and there, indeed, clumps of trees and tufts of herbage are to be seen; but even these become more and more scarce, till they entirely disappear; and the traveller must encounter a space, from eight to ten miles in extent, overspread with a flat expanse of snow and ice, and abounding in dangerous torrents of melted snow. Beyond this, the great crater rises; and at the highest summit of

the mountain, there is, according to Brydone, an ample recompense for toil and danger, in the most wonderful and sublime sight in nature.

Mrs. E. Is there not, in the woody region, a remarkable chestnut-tree?

Mr. E. There is, my dear. The eastern side of that part abounds particularly in chestnut-trees of the largest dimensions, which become a very profitable article of trade, by furnishing hoops for casks; on which account, the inhabitants attend very carefully to their cultivation. One tree has long been celebrated above the rest, for its extraordinary size, and is called the chestnut-tree of a hundred horse, from its supposed capacity of containing that number; but particularly from the fabulous tradition that the Queen of Spain once found shelter, with a hundred attendants, under this tree. Carrera says that there is wood enough in it to build a large palace. At the surface of the earth, it measures a hundred and ninety-six feet; and its height and size would have been like its dimensions, but for the practice of lopping off its branches for fuel. Some travellers have dug about it, to see if it were a cluster of several trees, or only one; and they have found that, although divided, at or near the surface, into five branches, they are all united in one root. From the main stems, a multitude of branches spring, each of prodigious size, and having the peculiarity of no bark on the inside. A hut is built in the hollow of the trunk, to accommodate those who are engaged in collecting and preserving the fruit. The use of ovens for drying the nuts, is thought to account for the want of

bark on the inner side of the branches. Other vegetable wonders are found in the neighborhood; and particularly one, with an undivided trunk, measuring fifty-seven feet, at the height of fifteen feet from the surface of the ground.

Mrs. E. It is, indeed, a most extraordinary spot. But the chestnut thrives well in most parts of Britain. Several large trees have been described to us. Fitz-Stephen, who lived in the reign of Henry II, speaks of an extensive forest of chestnuts, which sheltered the north side of London. A tree of this kind, at Totworth, in Gloucestershire, is said to have stood there in the year 1150; and in the same county there was another, in the hollow of which there was a 'pretty wainscoted room, enlightened with windows and furnished with seats.' The former has been called, for ages, 'the great chestnut of Totworth;' it measures fifty-two feet round, and still continues to bear fruit.

F. What a fine horse-chestnut-tree that is, papa, near the park gate! Its bunches of large white flowers are very beautiful. How many there were this year! I was quite sorry when they were gone. Is not this a different tree?

Mr. E. It is, my dear. The horse-chestnut is a native of the northern parts of Asia; and was brought to Europe about the year 1500. It affords a fine shade while the leaves are on; but as they begin to fall off in July, it soon loses its beauty. Its timber is but of little value. The deer in the park eat its nuts with avidity. The Turks, it is said, grind them, and mix them with the food of their horses. The bark has been

employed, with some success in dyeing yellow; and the prickly husks are used in tanning.

E. I am very fond of walnuts, papa: I hope we shall soon have a good many.

Mr. E. The fruit of the walnut-tree* is very agreeable: when green, the nuts make a pleasant and wholesome pickle; the oil is used for delicate colors in painting, for smoothing and polishing wood-work, and sometimes for burning in lamps. A dye is also obtained from the leaves, and recent husks in their green state. The form which the branches wear is generally beautiful. In May, the warm hue of its foliage makes a pleasing contrast with that of other trees; but its leaves open late, and fall early.

F. From whence did we obtain the walnut-tree?

Mrs. E. It is a native of the warmer parts of Europe, perhaps of Asia. It grows in various parts of the earth; in England it thrives well; and wherever it flourishes it is valuable. It advances rapidly, till it attains a considerable size, and is valuable as timber. Its principal use, however, is for the stocks of fire-arms. The demand for these during the late war, thinned England of its walnut-trees. At that time, the wood was in so much request that a fine tree has often been sold for several hundred pounds. Oh, what an evil is war! Its path is that of misery and death; yet many works in the hands of the young, were written under the power of a ferocious depravity. They teach the boy to hate or to despise every nation but his own; they pourtray war as

* Juglans regia.

the theatre of glory; they tell him to rejoice in the woes poured out on the people of other lands; and they often fill him with ambition to wear the blood-stained laurels of victory, by a work of destruction surpassing that which many have accomplished. I am thankful, Frederick, that your reading is directed, not only by affection, but by sound judgment: I trust that you will, therefore, see things as they are, and that you will imbibe and adorn the spirit of the gospel of peace.

F. I hope so too, mamma. I remember you once showed me the portrait of Howard, and wished that I should be like him. That would indeed be delightful!

Mr. E. It would, my dear.

> 'How beauteous are the feet of those who bear
> Mercy to man, glad tidings to despair!
> Far from the mountain's top they lovelier seem
> Than moonlight dews, or morning's rosy beam;
> Sweeter the voice than spell or hymning sphere—
> And listening angels hush their harps to hear!'

From this digression, which I thank mamma for making, we may now return to remark, that the walnut was once in England 'the cabinet-maker's tree,' and that to his purposes it was well adapted. In many parts of the continent, where the expense of carriage is great, it is still extensively used in the manufacture of furniture; but with us it has been generally superseded by a wood with which you are all familiar.

E. Oh, that is mahogany, papa!

Mr. E. It is. The seeds of the common one,* which are very light, are often blown into the

* Swietenia mahagoni.

chinks of rocks, where they take root, and at length produce trees of considerable size; and the wood of those that spring in this manner, from exposed situations, is harder than what grows in other places. The mahogany tree is singularly majestic. In the rich valleys among the mountains of Cuba, and in those that open on the Bay of Honduras, it expands into a trunk so gigantic divides into such massy arms, and throws the shade of its shining green leaves, spotted with tufts of pearly flowers, so far around, that it is difficult to imagine a production of the vegetable world combining so fully the qualities of elegance and strength, as to appear at once both beautiful and sublime. It is probably two hundred years arriving at maturity. A single log of this wood, imported at Liverpool, weighed nearly seven tons; and, a short time ago, Messrs. Broadwood, who made your piano-forte Emma, gave the large sum of three thousand pounds for three logs of mahogany, which were the produce of one tree.

Mrs. E. The employment of this wood arose from accident. About the beginning of the last century it was first brought to England, when a few planks were sent to Dr. Gibbons, of London, by his brother, a West Indian captain. As the doctor was building a house, he gave the planks to the workmen, who rejected them, as being too hard; some was also given to a cabinet-maker to make a candle-box, and he urged the same objection. But when it was finished, it was far brighter than the other furniture, and became an object of great curiosity. Dr. Gibbons had therefore, a bureau made of it, and the Duchess of

Buckingham another; the despised mahogany was thus taken into favor, and its use is now general.

E. Papa, very thin mahogany is used; for, when a piece was broken off the table the other day, I saw it was not much thicker than stout paper.

Mr. E. Once the solid wood was preferred, but now this, as well as others, is cut into thin pieces, called veneers; and thus the purpose is answered at far less cost. At first, the veneers were cut by hand; but latterly this has been done by machinery. I have seen one of these mills driven by steam, and consisting of a number of circular saws, the largest of which is eighteen feet in diameter. The teeth of the saws are rather wide, that they may not be clogged with the dust; and they revolve at a great rate. The log of timber is fastened in a frame, and placed flat in the direction in which it is to be cut. The frame is then carried steadily forward on its bed; and the saw cuts, for coarse work, about one foot of length in four seconds. When the wood is harder, or of more value, the motion is slower, but the quantity that may be produced is almost incredible. Cabinet makers, who wish to make goods very cheap, often have fifteen or sixteen veneers out of an inch of wood; but others think eight or nine thicknesses enough. A log fifteen feet long, and three feet each in other ways, would spread out, according to the former mode, to the extent of about an acre and three quarters; and when cut according to the latter, it would cover nearly an acre.

E. O papa, what a number of chairs, and tables, and pianos, that quantity would cover! And then what a deal of money it must save, when they make so little go a great way!

Mrs. E. Our houses are greatly indebted to this wood for their present appearance. Much of the furniture of former times was mean and ill-fashioned. But the huge oak tables and Windsor chairs made of elm, are now displaced by others of better form, and more graceful materials; and hence many advantages arise. The East India mahogany* is a very large tree. It rises to a great height, with a straight trunk which, towards the upper part, throws out many branches. The wood is of a dull red color, and not so beautiful as common mahogany, but much harder, heavier, and more durable. The natives of India consider it the most lasting timber that their country produces, and employ it in their temples, and wherever they want strength and durability.

F. I wonder, papa, how high a tree could grow.

Mr. E. There is a law of nature, my dear, by which the growth of trees is limited. That a larger body may have proportionate strength to a smaller, it must be made still thicker and more clumsy than it is made longer; and, beyond a certain point, no proportions whatever will keep it together, in opposition merely to the force of its own weight. We have, therefore, no trees reaching three hundred feet in height, even when perfectly perpendicular, and sheltered in forests which have been undisturbed from the beginning

* Febrifuga.

of time; and oblique or horizontal branches are kept within very narrow limits by the great strength required to support them.

Mrs. E. To explain this law more fully, think how massive are the limbs of the ox, the elephant, the rhinoceros, compared with the slender forms of the greyhound, the stag, and the antelope. And unless the bones were made of stronger material than now, a creature much larger than the elephant would fall to pieces from inward weakness. The whale is the largest of animals, but it feels not its mighty weight, because it is constantly supported by the ocean. The giants of the heathen mythology could not have existed on earth, for the same reason; although in the moon where weight or gravity is less, because of her smaller size, such beings might live. Granite, which is the strongest of rock, yields to the same law; and if any rock or cliff more remarkable than now remains on earth could be produced again, the monstrosity would soon be corrected. But, on the lunar orb, mountains of granite might be many times higher than on earth; and the observations of astronomers proves that they actually are so. It is also worthy of remark, that a gradation of form is perceptible from granite mountains down to those of chalk, gravel, and sand; and the geologist can generally tell the substance of which a hill is composed by the peculiarities of its shape. While, then, others overlook such facts, let us regard and trace them

> '————————to the will
> And arbitration wise of the Supreme.
> Did not his eye rule all things ———
> ————————or could chance
> Find place in his dominion, or dispose
> *One lawless particle* to thwart his plan;

> Then God might be surprised, and unforeseen
> Contingence might alarm him, and disturb
> The smooth and equal course of his affairs.'

— But, it is time that we should engage in devotional exercises, for which this thought may tend to prepare us.

ALTITUDES.

'In a recent conversation, my dears,' said Mr. Elwood, 'a curious fact was stated as to the height of mountains, and another occurred to me afterwards, which I will now mention. A little observation and experience will enable a traveller to conjecture the probable elevation of those he has ascended, or the height above the sea of the valleys which he traverses. For instance, the loftiest summits, and the most pointed tops of rock and ice, are not too elevated for the bouquetin. The chamois does not ascend so high, but he never enters the plains; he is only to be seen on very lofty ridges in the vicinity of the snow-line. The marmot and white hare frequent the slopes of mountains which are beneath the favorite haunts of this fleet and buoyant creature. The fox does not like to rise higher than where he can find brakes and thickets for concealment. The vulture and the eagle share the domains of the chamois, the ptarmigan those of the mormot; and, while the grouse and the heathcock aspire no higher than the pine-forests, the pheasant is

found in great abundance in almost all the woody heights which rise immediately above the valleys.

'The traveller has another guide in the vegetable products of the scene of his journeys. No oaks are seen at a greater height than about 3,300 feet. The chestnut seldom ascends above 2,400: the vine not more than 1,700. The orange and olive will only grow at the foot of the Alps, and principally near the coast. The birch, and the pitch-pine will flourish at an elevation of 4,500 feet; but the beech stops at about 4,000. Of fruit-trees, the cherry may be cultivated as high as any — at 3,000 feet. The alder ranges to 6,000; the rhododendron as high. The dwarf willow can bear the greatest altitude. Barley and oats will sometimes grow at upwards of 5,000 feet. Some of the finest pasturages are found at 7,000; and there are many herbaceous plants and grasses which can bear the elevation of 7,600 feet.'

E. That is very curious, papa; but do you know you have just mentioned several trees which you and mamma have not yet described? Is there anything curious about the beech?*

Mr. E. It is a valuable tree, my love, which, when sheltered, grows to a great height. The poet Virgil chose it for a shade; for no tree forms so complete a roof. Its head, however, is not beautiful, and its branches have neither the elegance of the ash, nor the firmness of the oak. The hue of the bark is an agreeable olive; and its trunk, often studded with bold knots, is gen-

* Fagus sylvatica.

erally picturesque. Its tints, in autumn, are very beautiful. The close texture of the wood adapts it to many purposes. The small timber makes excellent charcoal: the mast, or fruit, is eaten by hogs; and the poor in Silesia extract from it an oil, which they use instead of butter. The nut is sometimes burnt to make an infusion something like coffee. The finest beech on record appears to be that in Woburn park, situated on a rising ground south of the abbey, in a fine grove of that species. The height of this tree, at present, is one hundred feet. It has a clear and nearly equally cylindrical stem, fifty feet high; and the top, which is, in every respect, of the most graceful proportions, is of the same elevation. The solid contents are four hundred feet.

Mrs. E. The birch,* which papa also mentioned, is a graceful tree, diffusing an agreeable fragrance. When it arrives at a considerable size, the branches 'weep' or hang down; and as they are sometimes thirty or forty feet long, and not thicker than a common packthread, they are very beautiful, especially when their points dip in a clear mountain-stream. In some parts of the highlands of Scotland, the birch is a timber for all uses. The stronger stems are the rafters of the cabin; and wattles of the boughs are the walls and the floor. Sometimes, however, the turf, with the heather on it, is piled up for walls, and on these a few poles for rafters are placed, which have a covering of turf and green broom fastened together by straw bands or poles.

* Betula alba.

Chests and boxes are often made of a rude basket-work of birch. Of it, too, the highlander forms his spade, his plough, and, if he is so rich, his cart and harness; and, when other materials are used, withes of twisted birch still serve for cordage, which is, in fact, more durable than ropes of hemp, and the only preparation for which is to bark the twig, and twist it while green. In Kamschatka, the birches, which abound, are employed for making sledges; the green bark is cut in small pieces, and eaten with caviare, and the sap furnishes an agreeable drink. Strong and light canoes were, in early times, made of the bark; and it is still used for the same purpose in the northern parts of America. The canoe-birch, used by the Indians and French Canadians, is sometimes seventy feet high, and the weight of a canoe that will hold four persons does not exceed fifty pounds.

E. That is very handy, mamma; for one of them can take it up and carry it wherever he likes. Sometimes, too I should think a great deal of time may be saved; because he can thus take a cut across, instead of going all the way round.

Mr. E. It may be, Emma; but the uses of birch are various, not forgetting the large rod of it which the old schoolmasters found, I presume, very effective, as a teacher of Latin, Grammar, Geography, and other queer things of the same kind. I am glad that Frederick wants no such assistance, for my own sake as well as his. The alder* is not such a handsome tree as the birch,

* Alnus glutinosa.

neither is the timber applicable to so many useful purposes. It is a native of almost every part of Europe. Its bark, however, contains a good deal of tannin; the young shoots dye a yellow or cinnamon color, the wood a brown, and the catkins of the flower a green. The timber of one kind is red, and often so finely streaked that it is called in the north, Scotch mahogany, and of it furniture is made.

E. And then, papa, you said something about the willow.*

Mr. E. The weeping willow† is a native of the Levant, but it thrives well in England, if the situation be not too cold, and near the water. It rises to a considerable height, and no tree can be more graceful on the brink of a lake or stream. It is said that Pope, the poet, planted the first in England. Having received a present of figs from Turkey, he observed a twig of the basket in which they were packed, putting forth a shoot; this he planted in his garden, and it soon became a fine tree, from which all the weeping willows in England have sprung. This parent tree was, however, cut down a few years ago.

F. Is it useful as well as ornamental?

Mrs. E. It is: —

'The willow that droops by the side of a river,
And drinks all its life from the stream that flows by,
In return, spends that life in the cause of the giver,
And shadows the stream from the heat of the sky.'

The ancient Britons sometimes made their coracles or boats, of basket-work of willow, and then covered them with skins: they were remarkably light and buoyant. The osier,‡ when allowed,

*Salix. †Salix Babylonica. ‡Salix Viminalis.

becomes a small tree; but it is generally cut down for basket-work. For this it was employed at a very early period. The willow is also extensively used in the manufacture of charcoal, for which the wood is built up in a pyramidal form, and the pile covered with clay or earth, leaving a few air-holes, which are closed as soon as the mass is well lighted. In India, charcoal is manufactured by a particular caste or grade of the natives. And now, I think, I have described all that I omitted in former conversations, and mentioned just now.

E. Oh! but, papa, I will think of some more! Let me see! — now I have it — there's the poplar!

Mr. E. True: —

'The poplar, that with silver lines his leaf.'

Of this tree there are several kinds. The wood of the white poplar * is soft, but of it some things are made. On the continent, one species is manufactured into thin slices, called *sparterie*, which is made up into ladies' bonnets. The seeds of the former, also, are surrounded with a sort of cotton, of which an attempt has been made to produce paper, and even cloth. With the aspen, or trembling poplar, you are familiar: it is singular, because of the agitation of its leaves from the slightest breeze.

E. Now, mamma, I have thought of one for you — the ash.†

Mrs. E. The 'nothing ill;' as Spenser calls it, is one of the most valuable trees. It is denominated 'the husbandman's tree,' because it is unequalled for agricultural implements. Gilpin

* Populus canescens. † Frainus excelsior.

styles the oak the Hercules of the forest; and the ash the Venus. The one displays strength, the other elegance. The foliage of the ash is very beautiful; but it drops its leaves early, and, instead of adding its tint to the many trees of autumn, its boughs are desolate. This tree, like the beech, and the sycamore, shows the effects of water on vegetation in a remarkable manner, by producing, in stiff, dry soils, only a few stunted roots; whereas, in a deep, rich, free soil, innumerable fibres are developed, and the minutest expand with facility. In the same way, the bottom of the stems of particular plants change in certain situations to a bulbous structure, of which the Timothy and fox-tail grasses are examples; and the crow-foot, whose white blossoms may be seen sprinkled over the waters of every pond, or slow-running stream, during the summer months, has three leaves which are under water, divided into thread-like leaflets, while those which float on the surface are broad, rounded, and entire. The mountain-ash* is a hardy but slow-growing tree; its white flowers and bright red berries make it ornamental in the shrubbery; but the wood is soft, and not durable.

Mr. E. And I have thought of another tree:—

'——There, fast-rooted in his bank,
Stands, never overlooked, our favorite elm,
That screens the herdsman's solitary hut.'

E. And don't you remember, papa, that fine avenue at Windsor, called 'the Long Walk?' I think you said, when we were there, that those trees were elms.

* Pyrus aucuparia.

Mr. E. They are, my dear; though most of them have passed their prime. The elm rises to a greater height than the generality of English forest-trees: its foliage hangs at once full and loosely; so that it receives great masses of light, and produces 'the chequered shade' which imparts so much beauty to woodland scenes. It is the first tree which puts on its light and cheerful green; and sometimes very early in the season the branches are dark with innumerable small purple flowers, often as full as the subsequent leafy foliage. As, too, it has just occurred to me, I may mention a singular fact as to the autumnal coloring of leaves. M. Prinsep had observed that, in the leaves which naturally cover each other in part, the uncovered portion is always the more quickly and more deeply colored, and he felt anxious to determine if the change of color took place in darkness. On sheltering from the action of light, either the whole branches, or parts of leaves, he always found that all change of color was prevented. If the entire leaf was placed in the dark, it fell off green; if only a part, the rest changed color, and the covered portion retained its original hue. If he placed in the dark, leaves, or portion of leaves, which were yellow, before reddening, the leaf fell off yellow, or the covered part retained that color, while the rest became red; thus showing that the action of light was necessary in all the stages of coloring.

Mrs. E. A quotation from Conway's Travels will be an appropriate close to the present conversation: 'I must attempt a description of the hol-

low of Luz, for there is nothing in any other country to which I can liken it. Figure to yourself a cradle, or hollow, about two miles long, and about one mile broad, the sides of this cradle being the slopes of mountains, which rise from six to seven thousand feet above the level. This little hollow, which cannot be called a plain, because it contains within it some little eminences, is an enamel of the freshest and most beautiful hues in nature: the most living green is mingled with the rich golden of the ripe harvest, and the pale straw of the later grains. Oak, ash, fir, and other trees, various in their tints as in their names, are scattered single, or in clumps, over the little fields : the two Gaves, one from Gavarnie, and the other from Bareges, unite their streams, and flow in graceful curves through this little Eden. But these features of beauty and fertility are not confined to the hollow. Here the charm of a southern climate robs the mountain sides of their heath and fern, and clothes them with cultivation. Two miles up the mountain-sides, round and round the cradle, the yellow harvest chequers the landscape. At elevations which, in more northern countries, would be abandoned to the heath and the fir, waves the golden grain; and both the hollow and the slopes of the mountains, as far up as cultivation extends, are scattered with houses, and cottages, and villages. All this is beauty — and of the highest order. I now come to the picturesque. Upon one side of this valley, on an eminence entirely separate from the mountain, stands the town of Luz — its buildings, and its church rising out of the wood; and upon an-

other separate eminence, still higher, are seen the extensive ruins of the castle of Saint Marie. At the southern side of the castle, the defile of the Gavarine opens — a gorge presenting every feature of the picturesque: the sides are precipitous rocks, hanging thick with wood: a romantic bridge spans the stream; and, about four hundred feet above the river, embosomed in oak, and standing upon precipices, is seen the irregular range of buildings which constitute the baths of St. Sauveur. But the features of sublimity are still to be added: these are the lofty summits of the highest of the Pyrenees; jagged rocks and snow peaks, which, from various spots, and particularly from the ruins of St. Marie, are seen rising behind the nearer mountains, and forming a wider and still more sublime amphitheatre.'

PERSIAN SAGACITY.

'WHAT do you think, papa, mamma told me this morning?' said Emma.

'Something worthy your remembrance, no doubt, my dear little girl,' replied her father; 'but it is not easy to guess what.'

'Then I will tell you, papa,' was the rejoinder; 'it was that, when a Persian philosopher was once asked how he had acquired so much knowledge, he replied — "By not being prevented by shame from asking questions when I was ignorant."'

'His conduct was wise,' said Mr. Elwood, and deserves imitation; but you and Frederick, smile very knowingly. What else have you to tell me?'

'That we should like to do as he did, papa,' replied Frederick, 'that we may be wise too. You said, some time ago, if we found anything we did not understand in the Bible, and would come and ask you, you would tell us; and so we came to inquire about several things; and here comes dear — dear mamma, who will not, I know, let you be too tired.'

'I am sure, my dears, it will afford us pleasure to meet your wishes,' said Mr. Elwood; 'it is delightful to give you general information; but especially to instruct you in that 'word' which God 'has magnified above all his name.' But, what is your first question?'

F. What kind of a tree is the sycamore?

Mr. E. The name it bears is formed of two words; one means a fig-tree, and the other a mulberry-tree, because it resembles the latter in its leaves, and the former in its fruit. The sycamore is of the height of a beech, and bears its fruit in a manner quite different from other trees: it has them on the trunk itself, which shoots out little sprigs in the form of grape-stalks, at the end of which grow the fruit, close to one another, almost like a cluster of grapes. The tree is always green, and bears fruit several times in the year, without observing any certain seasons. The fruit has the figure and smell of real figs, but is inferior to them in the taste, having a disagreeable sweetness. Its color is a yellow, inclining to an

ochre, shadowed by a flesh-color. In the inside it resembles the common figs, except that it has a blackish coloring, with yellow spots. The tree is pretty common in Egypt; the people, for the greater part, live on its fruit, and think themselves well regaled when they have a piece of bread, a couple of sycamore-figs, and a pitcher of water. In Palestine, too, it is often seen. Its timber has been used in the construction of buildings, and has proved very durable. Dr. Shaw states, when describing the catacombs and mummies of Egypt, that he found both the mummy-chests, and the little square boxes, containing various figures, which are placed at the feet of each mummy, to be made of sycamore-wood, and thus preserved, uncorrupted and entire, for at least three thousand years.

E. Dear! how long it lasts! Amos called himself, papa, 'a gatherer of sycamore-fruit;' was there anything singular in this?

Mr. E. There was, my dear. It is stated, by several ancient writers, that the fruit of the sycamore must be cut, or scratched, either with the nail or with iron, before it will ripen; and, if our translators had said that Amos was a sycamore-tree dresser, it would have been more descriptive of his occupation before he became a prophet.

E. I should think so, papa. Now, mamma, will you tell us something about pomegranates?*

Mrs. E. It was, formerly, one of the most delicate fruits of the East. The tree sometimes

* Punica Granatum.

rises to the height of twenty feet, is covered with a brownish bark, and is divided into many small branches, which are armed with spines; the leaves are oblong, or lance-shaped, pointed, veined, of a deep green color, and placed upon short foot-stalks. Its flowers are large, of a rich scarlet color, and stand at the end of the young branches, and sometimes appear in clusters; but the times of their blowing are so irregular, that the succession is often continued for months. The fruit is about the size of an orange; the rind is thick and tough, externally reddish, internally yellowish, filled with a red, juicy pulp, contained in transparent, cellular membrane, and included in nine cells, within which numerous oblong, angular seeds are also lodged. The high estimation in which the pomegranate was held by the Israelites, is evident from its being one of the three kinds of fruit brought by the spies from Eshcol to Moses and the congregation in the wilderness; and from their mentioning it as one of the greatest luxuries they enjoyed in Egypt, and the want of which they felt so severely in the sandy desert. One principal recommendation of the promised land was its yielding promegranates.

F. Has the fruit been produced in England, mamma?

Mrs. E. Here it seldom arrives at maturity; but the tree is highly prized as an ornament, the flowers being of a bright scarlet color, and, especially the double ones, very handsome. The odor is as fragrant as their color is bright. This tree, too, is long-lived. At Paris and Versailles, some specimens have existed more than two centuries. But papa is ready for another inquiry.

E. What, papa, was the lign-aloe?

Mr. E. It is a tree eight or ten feet in height, with a tolerable stout stem. At the top grows a large tuft of jagged and thick leaves, broad at the bottom, but growing narrower towards the point, and about four feet in length. The blossoms are red, intermingled with yellow, and double, like cloves; from which comes a red and white fruit, of the size of a pea, oblong and triangular, with three apartments filled with seed. The tree has a very beautiful appearance, and a forest of them is said to resemble a numerous encampment. Under the bark there are three sorts of wood: the first black, solid, and weighty; the second tawny, of a light spongy texture, and filled with a fragrant and agreeable resin; the third, which is the heart, of a fine, strong aromatic smell, used for perfume, and esteemed, in the East, as more precious than gold.

F. Are other aloes remarkable?

Mr. E. In China the aloe has the height and figure of an olive tree. It contains within the bark three sorts of wood: the first, black, compact, and heavy, is called eagle-wood — it is scarce; the second, called calambooc, is light, like rotten-wood; the third, near the centre, is called calamba-wood, and sells, in India, for its weight in gold. Its smell is exquisite: it is an excellent cordial in cases of fainting, or of palsy.

E. What can you tell us about manna, mamma?

Mrs. E. I will read you, in answer to this question, a quotation from Burckhardt. He says it is obtained from the tamarisk, or tarfa: — 'In

the month of June it drops from the thorns of the tree on the fallen twigs, leaves, and thorns, which always cover the ground beneath that tree in the natural state; the manna is collected before sun-rise, when it is coagulated, but it dissolves as soon as the sun shines upon it. The Arabs clear away the dust and leaves which adhere to it, boil it, strain it through a coarse piece of cloth, and put it into leather skins: in this way they preserve it till the following year, and use it as they do honey, to pour over their unleavened bread, or to dip their bread into. I could not learn that it was ever made into cakes, or loaves. The manna is found only in years in which copious rains have fallen: sometimes it is not produced at all, as will probably happen this year.' But this statement does not satisfy me that the manna the traveller has described was that of the Israelites.

F. What do you think it was, then, mamma?

Mrs. E. Its substance is, I think, unknown; but I have no doubt that, so far from its being a natural production, it was *miraculously* sent to relieve the wants of the Israelites. I will mention some remarkable points of difference, which have been suggested by a most judicious Jewish interpreter. The natural manna was never found in the desert where this fell: where the common manna does fall it is only in the spring-time, in March and April, whereas this fell throughout all the months of the year: the ordinary manna does not become corrupt, as this did, if kept till the morning: it cannot be ground or beaten in a mortar, so as to make cakes, as this

was: the common manna is medical, and cannot be used for food, like this: this fell in a double proportion on the sixth day, and not on the Sabbath, as it would have done had it fallen naturally: it followed the Israelites in all their journeys, wherever they pitched their tents; and it ceased at the very time of the year when the other falls. It is evident that they never saw it before; and, by a pot of it being laid up in the ark, it is as likely that nothing of the kind appeared again.

F. Thank you, dear mamma; we will try and remember what you have said; and perhaps papa will now be so kind as to describe to us the palm-tree.

Mr. E. The trunk is remarkably straight and lofty, and is crowned at the top by a large tuft of leaves, about four feet long, which are constantly renewed, and always retain their rich verdure. The stalks are generally full of rugged knots, which are vestiges of decayed leaves; for the trunk of the tree is not solid, but its centre is filled with pitch, round which is a tough bark, full of strong fibres when young, which, as the tree grows old, hardens, and becomes ligneous, or woody. To this bark the leaves are closely joined, which, in the centre, rise erect, but, after they are advanced above the sheath that surrounds them, they expand very wide on every side of the stem, and, as the older leaves decay, the stalk advances in height. The leaves, when the tree has grown to a size for bearing fruit, are six or eight feet long, and very wide when expanded. The fruit called the date grows below the leaves in clusters.

E. Is it long before it bears fruit?

Mr. E. The palm-tree arrives at its greatest vigor about thirty years after transplantation; and continues so for seventy years, bearing annually fifteen or twenty clusters of dates, each of them weighing fifteen or twenty pounds. Its produce, however, depends much on circumstances. It requires no other culture and attendance than to be well watered once in four or five days, and to have a few of the lower boughs lopped off, whenever they begin to droop or wither. Those whose stumps, or pollices, being thus gradually left on the trunk, seem like so many rounds of a ladder, to climb up the tree, are quickly supplied with others, which gradually hang down from the top or crown, contributing, not only to the regular and uniform growth of the tree, but, likewise, to its perpetual and delightful verdure. Rearing its stem, and expanding its broad and beautiful shade where there is nothing else to shelter man from the burning rays of the sun, the palm-tree is hailed by the wanderer in the desert with more pleasure than any other tree; for, in addition to its shade and its fruit, wherever a little clump of palms contrasts their bright green with the red wilderness around, he may almost be sure that he shall find a fountain ready to afford him its cooling and refreshing water. When Moses and the Israelites arrived at Elim, they found twelve wells of water, by the side of seventy palm-trees; and Sir Robert Wilson says, that when the English army landed in Egypt, in 1801, to expel the French from that country, Sir Sidney Smith assured the troops that,

wherever date-trees grew, water must be near; and so they found it, on digging usually within such a distance that the roots of the tree could obtain moisture from the fluid. Water is indeed a precious element, but never so valuable as in such circumstances. 'To be thirsty in a desert,' says Belzoni, 'without water, exposed to the burning sun without shelter, and with *no hopes* of finding either, is the most terrible situation that a man can be placed in, and one of the greatest sufferings that a human being can sustain.'

E. I am not surprised then, mamma, that people love the palm-tree.

Mrs. E. There are many reasons for their doing so. The harvest of dates is expected with as much anxiety, and attended with as general rejoicing, as the vintage of the South of Europe. The crop sometimes fails, or is destroyed by locusts, and then a universal gloom prevails. When no ripe dates can be procured, the principal substance of the people is the date-paste, which is prepared by pressing the fruit, when fully matured, in large baskets. 'What is the price of dates at Mecca, or Medina?' is always the first question asked by a Bedouin, who meets a passenger on the road. There is hardly any part of the tree which is not serviceable to man, either as a necessary or a luxury. When the fruit is completely ripened, it will yield, by strong pressure, a delicious syrup, which is used for preserving dates, and other fruits, or the fruit may be made into jellies and tarts. Palm-wine is also made from the date.

E. Can anything more be done with it, papa?

Mr. E. Gibbon says, that the diligent natives celebrated, either in prose or verse, the three hundred and sixty uses to which the trunk, the branches, the leaves, the juice, and the fruit were skilfully applied. And Dr. Clarke remarks, that the extensive importance of the date-tree is one of the most curious subjects to which a traveller can direct his attention. A considerable part of the inhabitants of Egypt, of Arabia, and of Persia, subsist almost entirely on its fruit. They boast also of its medical virtues. Their camels feed on the date-stone. From the leaves they make couches, baskets, bags, mats, and brushes; from the branches cages for their poultry, and fences for their gardens; from the fibres of the boughs, thread, ropes, and rigging; from the sap is prepared a spirituous liquor; and the body of the tree furnishes fuel, and also yields a nutritious substance.

Mrs. E. From another and smaller species,* which is a native of the East Indies, the supply of this farinaceous matter is better and more abundant. It is a very low tree, or rather a great leafy bush; for the trunk is never above a foot and a half, or two feet in height, and the leaves completely conceal it. These are of a much deeper green, and much narrower than those of the date. The berries are about the size of kidney beans, and of a shining black; they have not much pulp, but what they have is sweet and mealy. In times of scarcity, the natives of Hindostan have recourse to the wood of this palm for food. When the stem is stripped of the leaves, and of the

* Phœnix farinifera.

brown fibrous matter with which their roots are covered, it is about eighteen inches long, and six in diameter where thickest. The outside consists of woody fibres, of a white color, and very much matted together, and within these the farinaceous matter is contained. To obtain that, the trunk is split into pieces; these are dried, beat in mortars, and then the mass is shifted to separate the fibres. After this the farina is ready for being boiled into congee, or gruel, which has saved the lives of many whom famine has threatened with destruction.

E. Now, I suppose we have heard every thing about the palm. What an extraordinary tree it is!

Mr. E. Oh, no! much more remains to be told. The true sago-palm of Asia yields a greater quantity of nourishing matter than any other plant, except the banana. The single trunk of a tree of this species, in its fifteenth year, sometimes furnishes six hundred pounds of sago. It has even been calculated that a single acre of land will support four hundred and thirty-five sago-palms, which will annually produce 120,500 pounds of sago.

E. What a quantity! How many sick people would that relieve, though they ate as much as I did when I was ill! But I must listen, and not talk; for I see you have more to tell us, — and mamma is just bringing a book to the table.

Mr. E. The northern bank of the Oronoco, the great river of South America, is covered with palms, which produce sago. The whole country

in which they abound is subject to inundations; and the fan-like branches of these trees look like a forest which rises out of the bosom of the waters. The navigator, who passes along, is surprised to see the tops of these trees lighted with fires. They are kindled by the Guanacas, a people who have remained for ages in these marshy districts, — secured from the floods by living among the palms. In the branches they suspend mats, which they fill with clay, and on this damp hearth kindle the fires which are necessary to their comfort. The palm offers to this rude race, as well as to other tribes who inhabit the Gulf of Darien, and the watery lands between the Guarapitha, and the mouths of the Amazon, — a safe habitation amidst their 'perils of waters.' It affords them, also, in its fruit, its farinaceous bark, its sap, abounding with sugar, and its fibrous stalks,— pleasant food to eat, wine to drink and thread to make cordage and hammocks. 'It is curious to behold,' says Humboldt, 'in the lowest stage of human civilization, the existence of a whole race depending upon a single species of palm, in a similar degree with those insects which subsist but on one species of flower.'

Mrs. E. I must read you an extract from Dr. Walsh's Brazil, which will present you with another singular fact: 'Among the trees which gave the woods, to a European, a peculiar character, none was more striking than the singularity of the palm-trees. These were seen shooting above the rest to an immense height, with their long and slender stems crowned with feathery foliage, like ostriches' plumes, waving in the air; and of all

these the assai is the most elegant and beautiful. It is the taper palm which yields the cabbage. It rises from a slender stem, not more than six inches in diameter at the base; and it shoots sometimes up to the height of a hundred feet or more. The stem is marked by annual rings, five or six inches asunder; and near the summit is a long succulent, or juicy cylinder, from which the leaves issue. This green foot-stalk contains the embryo of the plant. It consists of the rudiments of the future leaves, beautifully plaited and convoluted at the centre; and their development from hence forms the elegant tuft that crowns the summit. This portion is exceedingly tender, yielding a pleasant and wholesome vegetable, like cabbage, boiled and eaten with meat. From all parts of the woods, this elegant tree was seen shooting above its companions, waving in every breeze its long flexible stem, and its tuft of light silken leaves. It seemed, indeed, to belong more to the sky than to the earth: in some places, it crowned the summits of the highest ridges, and was the only one whose foliage was seen projected on the blue sky, like Berenice's hair floating in the starry firmament; for the stem that supported it was so slender that it could not be discerned in the distance. It was with great regret I first attacked this beautiful tree, and utterly destroyed it for the small portion of its esculent part. When we saw it growing on the side of a hill, near the road, we seized its taper stem, and bent it down, till it snapped off near the root, and lay prostrate across the way. Here we cut off its graceful head, and left its body to

decay. In any other country this might be deemed a wanton and unjustifiable act of destruction; but, in this, it was only removing that which encumbered the soil with its profusion.'

F. Ah, that is remarkable! I fear now, papa, you and mamma must be quite tired.

Mr. E. Not too much so to mention a few things more. The Brazilians are beginning to use the ticu-palm* as a substitute for hemp and flax. The leaf is long and exceedingly fibrous, covered with small spines. When bent in the middle, the ribs of the leaf, which are very brittle, crack and separate; the ends are then drawn down at each side, and leaves a series of strong fibres of the best quality behind them, which are very applicable to the purposes of manufacture. The tree is fifteen or twenty feet high; and the stem as thick as the wrist, divided into joints, and circle of spines round each. It yields, also, an acid fruit, which grows in clusters on the summit of the stem. It consists of a stone covered over with a pulp, and enclosed in a purple skin, so that it is very like a bunch of purple grapes. The fruit is cooling and agreeable: the stone exactly resembles a cocoa-nut in miniature, and has a kernel within.

Mrs. E. In the city of Delhi, there is said to be an extraordinary work of art, called 'the peacock-throne.' It is an oval form, placed under a palm-tree which overshadows it with its foliage; a peacock, perched on one of the large palmated leaves, stretches its wings to cover the person who

* Bartris acanthocarpos.

is seated on the throne. The palm-tree and peacock are of gold; so thin and delicate are the feathers and leaves that they seem to wave and tremble with the slightest breath of wind. The tail and wings of the peacock glitter with superb emeralds. The fruit of the palm is partly executed in Golconda diamonds, and it is an exact imitation of nature.

The root of the palm-tree produces a great number of suckers, which, spreading upwards, form a kind of forest. Under a little wood of this kind, it has been thought, the prophetess Deborah dwelt, between Ramah and Bethel; and Dr. Shaw supposes that, when it is said, 'the righteous shall flourish like the palm-tree,' the prophet alludes rather to this multiplication of it than to its towering height. It is probable that Tamar, or Tadmar, built in the desert by Solomon, and afterwards called Palmyra by the Greeks, obtained its name from the number of palm-trees which grew about it. The finest appear, however, to have grown in the vicinity of Jordan and Engeddi; and they still flourish in the plain of Jericho, which was anciently termed, by way of distinction, 'the city of palm-trees.' In 1818, but few of them were left. The palm-tree was the common symbol of Palestine: many coins of Vespasian and other emperors being extant, in which Judea is personified by a disconsolate woman sitting under a palm-tree. It is frequently employed in the Scriptures as an image; but 'chiefly is the comparison applicable,' says Bishop Horne, 'to the Just One, the King of Righteousness, and Tree of Life; eminent and upright; ever ver-

dant and fragrant; under the greatest pressure and weight of sufferings, still ascending towards heaven; affording both fruit and protection; incorruptible and immortal.'

E. I have just thought, mamma, that those who stand around the throne have palms in their hands.

Mrs. E. They have, my dear, as the symbols of victory: but they enjoy the glory which is yet to be revealed. We have often gazed on the beauties of this lower world; and, as we do so, we may well say with the poet,—

> 'Oh, good beyond compare!
> If thus thy meaner works are fair,—
> If thus thy bounties gild the span
> Of ruined earth and sinful man:
> How glorious must that mansion be
> Where thy redeemed shall dwell with thee!'

E. Oh, dear Frederick! what a number of delightful things we have heard since I told papa about the philosopher! Let us do as he did, *always*.

Mr. E. I shall be glad to find you do, my dears; and then you will owe much to an imitation of Persian sagacity.

THE LAST ROSES.

'I AM so sorry, mamma,' said Emma; 'these seem the last roses we shall have this summer; the others — and there was such a number! are all gone; and these will soon fade.— I wish they were all about to bloom.'

'We must wait for that pleasure,' replied Mrs. Elwood; 'and, in the mean time, regard the memento they give of our own frailty. In this world we must look for disappointments and sorrows — they are a part of the common lot: but life has its pleasures and its joys too. How beautifully has some writer said, to one who declared it had no reality but woe,—

'Oh! say not so — although to man
No longer it is given,
To breathe the gales of Paradise,
And hear the strains of heaven; —
Though sin has shed her withering blight
On all that once was fair and bright;
And each his pligrim path must tread,
Where thorns and briers are thickly spread;
Yet many a floweret, in its bloom,
Flings o'er this path its rich perfume;
And many a spot of brightest green,
To gem the wilderness is seen.'

'I should like to learn those verses, mamma,' said Emma, 'they are so pretty! But, do you know, as I looked at the roses we have just passed, I thought of Jonah when his gourd withered, what sort of a plant or tree was that, mamma?'

Mrs. E. That is a question to which many different answers have been given. Michäelis thought it was the 'kiki' of the Egyptians. In Greece, we are told, this plant springs spontaneously, with-

out any cultivation; but the Egyptians sow it on the banks of the river, and of the canals; and there it produces fruit in abundance. This plant runs, with a strong herbaceous stalk, to the height of ten or twelve feet, and has very large leaves. Rabbi Kimchi states that the people of the east plant them before their shops, for the sake of the shade, and to refresh themselves under them.—Niebuhr says, 'I saw, for the first time, at Basra, the plant mentioned by Michäelis. It has the form of a tree. The trunk appeared to me rather to resemble leaves than wood. Each branch has but one large leaf, with six or seven foldings in it. It had risen in five months' time, about eight feet, and bore, at once, flowers and fruit, ripe and unripe. The flowers and leaves of another tree of the same species, which I gathered, withered in a few minutes, as do all plants of rapid growth.' It is not improbable that Jonah's gourd was of this kind. But, as the history expressly says the Lord prepared this plant, we may conceive of it as an extraordinary one of its species — remarkably rapid in its growth, remarkably hard in its stem, remarkably vigorous in its branches, and remarkable for the extensive spread of its leaves, and the deep gloom of their shadow; and, after a certain duration, remarkable for a sudden withering, and a total uselessness to the impatient prophet. Now I think we will return to the house. Our walk has been pleasant:—and there — papa and Frederick are coming, and will soon join us.

E. Papa, will you allow me to ask you one or two questions, while you take your coffee?

Mr. E. Twenty, if you please, my little Persian.

E. What were the husks the prodigal son wished to eat?

Mr. E. Both the Greek and Latin terms signify the fruit of the carob-tree, which is very common in the Levant, and in the southern parts of Europe. It still continues to be used for feeding swine. It is also called St. John's bread, from the idea that the Baptist used it in the wilderness. It is said to be mealy, to have a sweetish taste, and to be eaten by the poorer people. In Arabia, the trees which bear this fruit are called kharunts: they are of a large size, and the branches spread very wide. The leaves have a resemblance to those of the pear-tree, only they are broader, and not so much pointed: they are evergreen, and afford an agreeable shade in the heat of the sun. The fruit consists of pods, which are rather longer than a finger, an inch broad, and as crooked as a sickle: they have a very sweet and pleasant taste.

E. Thank you, papa; that is all quite new to me. Now will you tell us something about cinnamon?

Mr. E. It is not improbable that Solomon imported it from India. In the island of Ceylon, however, it especially flourishes. I will read you an account of it from Bishop Heber's Journal. 'In the afternoon we drove through the far-famed cinnamon-gardens, which cover upwards of 17,000 acres of land on the coast, the largest of which are near Colombo. The plant thrives best in a poor sandy soil, in a damp atmosphere: it grows

wild in the woods to the size of a large apple-tree; but when cultivated, is never allowed to grow more than ten or twelve feet in height, each plant standing separate. The leaf is something like that of the laurel in shape, but of a lighter color: when it first shoots out it is red, and changes gradually to green. It is now out of blossom; but I am told that the flower is white, and appears, when in full bloom, to cover the garden. After hearing so much of the spicy gales from this island, I was much disappointed at not being able to discover any scent, at least from the plants, in passing through the gardens: there is a very fragrant-smelling flower growing under them, which at first led us into the belief that we smelt the cinnamon, but we were soon undeceived. On pulling off a leaf or a twig, one perceives the spicy odor very strongly; but I was surprised to hear that the flower has little or none. As cinnamon forms the only considerable export in Ceylon, it is of course preserved with great care: by the old Dutch law, the penalty for cutting a branch, was no less than the loss of a hand; at present, a fine expiates the same offence. The neighborhood of Colombo is particularly favorable to its growth, being well sheltered, with a high equable temperature; and as showers fall very frequently, though a whole day's heavy rain is uncommon, the ground is never parched.'

F. How, papa, is the cinnamon prepared?

Mr. E. Bishop Heber has anticipated your question. He says, 'The manager of the cinnamon-gardens good-naturedly sent some of the cinnamon-peelers to our bungalows, that we might

see the way in which the spice is prepared. They brought with them branches of about three feet in length, of which they scraped off the rough bark with knives, and then, with a peculiar shaped instrument, stripped off the inner rind in long slips; these are tied up in bundles, and put to dry in the sun, and the wood is sold for fuel. In the regular preparation, however, the outer bark is not scraped off; but the process of fermentation which the strips undergo, when tied up in large quantities, removes the coarse parts.' In South America, cinnamon is used for its medicinal properties; 92,000 pounds are said to be consumed annually by the slaves in the mines of that country. Each receives daily a certain quantity, cut into pieces an inch long, which he eats as a preservative against the noxious effluvia of the mines.

F. What is myrrh, papa?

Mr. E. It is a white gum, issuing from the trunks and larger branches of a thorny tree, resembling the acacia, growing in Arabia, Egypt, and Abyssinia. Its taste is extremely bitter; but its smell, though strong, is agreeable; and it entered into the composition of the most costly ointments among the ancients. We read, in the book of Exodus, of '*pure* myrrh;' by which is meant the finest and most excellent kind, called also stacte, which issues from the bark without incision. It is said by Mark, that they gave Christ to drink, 'wine mingled with myrrh, but he received it not;' because it appears that this drink produced mental agitation. Through motives of humanity, such draughts were usually adminis-

tered to those who were about to endure a painful death; but Jesus rejected such a mitigation of his sufferings, and therefore, after tasting it, refused the cup.

E. Can you describe to us what shittim-wood was, mamma?

Mrs. E. St. Jerome says that it grows in the deserts of Arabia, and is like white thorn as to its color and leaves; but the tree is so large as to furnish very long planks. The wood is hard, tough, and extremely beautiful. It is thought he means the black acacia, because that is the most common tree in the part of the earth to which he refers. It is of the size of a large mulberry tree. The spreading branches and larger limbs are armed with thorns, which grow three together. The bark is rough, and the leaves are oblong, standing opposite each other. The flowers, though somewhat white, are generally of a bright yellow; and the fruit, which resembles a bean, is contained in pods, like those of the lupin. Another tree is mentioned in Scripture, to which no allusion has yet been made. In our ungenial climate, the myrtle is a lowly shrub; but, in more favorable countries, it sometimes grows to a small tree. It has a hard, woody root, that sends forth a great number of small flexible branches, furnished with leaves like those of box, but much smaller and more pointed; they are soft to the touch, shining, smooth, of a beautiful green, and have a sweet smell. The flowers grow among the leaves, and consist of five white petals, disposed in the form of a rose: they have an agreeable perfume, and ornamental appearance. They are succeeded by

an oval, oblong berry, adorned with a sort of crown, divided into three cells, which contain the seed. Thus we read, 'I will plant in the wilderness, the cedar and the shittah-tree, and the myrtle and the oil-tree;' that is, 'I will adorn the dreary and barren wilderness with trees famed for their stature, and the grandeur of their appearance, the beauty of their form, and the fragrance of their odor.' Savary describes a scene at the end of the forest of Platanea, and says, 'Myrtles, intermixed with laurel-roses, grow in the valleys to the height of ten feet. Their snow-white flowers, bordered within with a purple edging, appear to peculiar advantage under the verdant foliage. Each myrtle is loaded with them; and they emit perfumes more exquisite than the rose itself.'

Mr. E. As your questions, my dear children, seem to be exhausted, I will allude to the consecration of groves to various idols. This custom appears to have arisen from the idea that shade and solitude were adapted to inspire the worshippers with a solemn and superstitious dread of those divinities which they were taught to believe were present in such spots. 'If you find,' says Seneca, 'a grove thick set with ancient oaks, that have shot up to a vast height, the tallness of the wood, the retirement of the place, and the pleasantness of the shade, immediately make you think it to be the residence of some god.' To this Hosea refers, when he says, 'They sacrifice upon the tops of the mountains, and burn incense upon the hills, under oaks, and poplars, and elms, because the shadow is good.' Isaiah's declaration,

'They that sanctify themselves, and purify themselves, in the gardens, behind one tree in the midst,' may also be easily explained. For not only sacred groves in general, but the centres of such groves in particular, were made use of for temples, by the first and most ancient heathens. Indeed, some one tree in the centre of each grove was usually had in special veneration. As groves were thus the scenes of idolatrous rites, the Jewish people receive the command, 'Thou shalt not plant thee a grove of any trees, near unto the altar of the Lord thy God;' but from their proneness to imitate the customs of surrounding nations, they became guilty of sacrificing in high places, and in consecrated groves; and a king carried his impiety so far as to plant one of them at Jerusalem. In opposition to the feeling thus displayed, the Israelites were enjoined to cut down such groves as had been polluted by the idolatrous Canaanites; and the promptness with which Josiah destroyed those on the Mount of Olives, which had been consecrated to Astaroth, Chemosh, and Milcom, shows the freedom of his mind from debasing superstition, and the strength of his faith in the living God.

E. Oh, papa, how sad it is that they are so superstitious!

Mrs. E. And still worse that so many resemble them. When, for instance, a new idol was to be manufactured in the Sandwich Islands, a royal and priestly procession went forth, with great ceremony to the destined tree; where the king himself, with a stone axe, laid the first stroke to the root; and, after it had been felled, a man or

a hog was butchered, and buried on the spot where it had grown. The principal god of the late Tamehameha was a huge, unsightly block (for there were no 'cunning workmen' to work 'graven images,') yet, so soon as this scaramouch, fantastically dressed with feathers and flowers, was heaved upon a man's shoulders to be carried to or from any particular marae, all the people on the way were obliged to uncover their persons, and prostrate themselves on the ground. Karaipahua, however, was the most formidable of their deities, and the fittest symbol of that most malignant being, 'the god of this world,' whom they all represented. This idol was more elaborately shapen and curiously adorned than most of his kindred. It was carved out of a tree which grew in the island of Morokai, the wood of which was said to be so dreadfully deleterious, that a little of it, scraped into a mess of food, would turn it into deadly poison. Even the chips of the raw material of this divinity, during the felling of the tree, were so venomous that they killed several persons who happened to be hit by them as they flew off at the blows of the axe, so that the workmen were obliged to cover themselves, from head to foot, till they had brought this *upas* to the ground. Perhaps, however, the baneful qualities attributed to this sacred wood were as fabulous as all the other horrors ascribed to the image which they sculptured out of it.

Mr. E. Referring to the island of Huahine, Messrs. Tyerman and Bennet say, 'We landed to examine a famous marae, and also a far more famous tree, which may be regarded as the most

extraordinary native production of these islands; indeed we gazed upon it with overwhelming astonishment. This tree is called *aoa* by the natives. The trunk is composed of a multitude of stems grown together, and exhibiting a most fantastical appearance from the numerous grooves, which run vertically up the bole, and are of such depth that a transverse section would rudely resemble the axle and spoke of a wheel without a rim. The girth near the foot, is seventy feet. From the height of eight feet, and onward to forty, immense branches proceed, in nearly horizontal lines, on every hand; from which perpendicular shoots tend downward, till they reach the ground, take root, and become columns of the 'pillared shade.' More than forty of these we counted, standing like a family of earth-born giants about their enormous parent. A circle, drawn all round these auxiliary stems, measured one hundred and thirty-two feet in circumference; while a circle, embracing the utmost verge of their lateral ramifications was not less than four hundred and twenty feet. The upper stories (if we may so call them) of this multiform tree, presented yet more singular combinations of intersecting and intertwisting boughs, like Gothic arches, oriels, and colonnades, propped, as by magic, in mid-air. These were occasionally massy or light, and everywhere richly embellished with foliage, through which the flickering sunshine gleamed in long rays, that lost themselves in the immensity of the interior labyrinth, or danced in bright spots upon the ground, black with the shadows of hundreds of branches, rising, tier

above tier, and spreading, range beyond range, aloft and around. The height of this tree (itself a forest) cannot be less than eighty feet.'

E. Oh, what a giant! Was any thing idolatrous done there, papa?

Mr. E. Yes, there was. Not far from its site there is a Christian chapel, and a pagan marae hard by, where the sovereigns of Huahine were buried, — and where, indeed, they lay in more than oriental state, each one resting in his bed, at the foot of the Sacred Mountain, beneath the umbrage of the magnificent aoa, and near the beach forever washed by waters that roll round the world, and spread themselves here after visiting every other shore between the poles. The great marae itself was dedicated to Tani, the father of the gods here; but the whole ground adjacent was marked with the vestiges of smaller maraes — private places for worship, and family interment — while this was the capital of the island, and the head-quarters of royalty and idolatry.

On the limbs of the tree already described, there is reason to believe that thousands of human sacrifices have been hung. One low bough, of great length and bulk, was pointed out as having the principal gibbet for such victims, century after century. The tree itself was sacred to Tani; but he has been expelled hence; and for ages to come, under the shadow of this prodigy of vegetation, it is to be hoped that 'incense and a pure offering' — the incense of prayer, and the pure offering of bodies, presented as 'living sacrifices' — will continue to be made

here to the true God, by more of *his* spiritual worshippers than Satan had of *his* deluded votaries in all the times gone by.

F. I hope so, too. But, Emma, papa and mamma are going: won't you thank them for so many interesting things?

E. Oh, yes, Frederick! — we will both thank them again and again!

AN AUTUMNAL MORNING.

'How gorgeous are our woods at this season!' said Mr. Elwood; 'their majesty and sublimity strike and charm the eye, and vividly impress the mind. But they awaken a lively interest in my bosom when spring comes, and they appear in the delicacy of their pride; in summer, when they are shadowy and aromatic; in winter, when, robbed of their foliage, they reveal the underwork and tracery of their branches; no less than in autumn, when arrayed, like the sun as he is about to sink below the horizon, in their last splendor.'

'Your feelings are natural, my dear,' said Mrs. Elwood; 'for, in addition to the native beauty of trees and woods, much that is interesting is associated with them. Xerxes, in the midst of his most ambitious enterprize, stopped his immense army to contemplate the beauty of a tree. Cicero was accustomed to refresh and invigorate

his spirits in a grove of palm-trees; and in similar circumstances, Thucydides is said to have composed his noble histories. In the merry greenwood 'the mind of the English poet first awoke to a sense of beauty: the soft bright sward, enamelled with wild flowers — the up-sparkling well-spring, making music in its joyous course — the rich melody of our native wild birds — the lordly stag bounding along like a vision — the sun-light glancing from hill to valley, gilding the dark masses of foliage with momentary splendor — the giant oak, stretching his hundred arms in century-hallowed majesty, the proud type of our land — these were the sources from whence our early poets drank inspiration; but lastly, and above all, here was made the first stand for liberty.'

Mr. E. Forests must have been the abodes of European tribes, when they lived upon acorns. Even now, the palm-forests afford shelter to the nations of Africa. Hunting was the natural occupations of these people; but, at the dawn of civilization, the tribes of hunters, having more vigorous minds and bodies from their dangers and toils, must have more rapidly improved, and must have built houses and towns at a much earlier period. The forests would furnish them with the materials and the model of their architecture. Trunks of trees, supporting a verdant roof, suggested the first idea of Grecian and Indian colonnades; whilst Chinese architecture consists only of tents imitated in wood and stone; and, in the Gothic, are recognized the images of gloomy caverns, and steep rocks.

It is probable, too, that, in very early times, a great part of Britain was covered with forests; but, as the arts of life advanced, the people permitted the wolves and bears to occupy them, associated together in towns, and cultivated the open country. Only about eleven, however, are said to have preserved their rights. 'It is impossible,' says Mr. Nicholas, 'to imagine, in the wildest and most picturesque walks of nature, a sight more sublime and majestic, or which can more forcibly challenge the admiration of the traveller, than a New Zealand forest. And Mr. Ellis, in describing the forest he visited, remarks, 'The earth was completely covered with thick-spreading, and forked roots, brambles, and creeping plants, overgrown with moss, and interwoven so as to form a kind of uneven matting, which rendered travelling exceedingly difficult. The underwood was in many parts thick, and the trunks of the lofty trees rose like clusters of pillars, supporting the canopy of interwoven boughs and verdant foliage, through which the sun's rays seldom penetrated. There were no trodden paths, and the wild and dreary solitude of the place was only broken by the voice of some lonely bird which chirped among the branches of the bushes, or, startled by our intrusion on its retirement, darted across our path. A sensation of solemnity and awe involuntarily arose in the mind, while contemplating a scene of such peculiar character, so unlike the ordinary haunts of men, and so adapted, from the silent grandeur of his works, to elevate the soul with the sublimest conceptions of the Almighty. I was remarkably struck with

the gigantic size of many of the trees, some of which appeared to rise nearly one hundred feet, without a branch, while two men, with extended arms, could not clasp their trunks.'

Mrs. E. In the forests of the United States, the trees most universally diffused are the willow-leafed oak, which grows in the marshes; the chestnut oak, which, in the southern states, rises to a prodigious size, and is as much esteemed for its nuts as its wood; and the white, red, and black oak. The walnut, the chestnut, and the elm of Europe, also, abound almost as much as the oak. The tulip-tree, and the sassafras — more sensible to cold than these others, are stunted shrubs at the confines of Canada — assume the character of trees in the middle states; but upon the hot banks of the Alatamaha, they reach their full size, and display all their beauty and grandeur. The amber-tree, which yields an odorous gum, with many others, are found growing in every place where the soil suits them. It is in Virginia, and in the southern and south-western states, that the American Flora displays its wonders, and the savannas wear their perpetual verdure. It is there that the magnificence of the primitive forests, and the exuberant vegetation of the marshes, captivate the senses by the charms of form, color, and perfume. If we pass along the shores of Carolina, Georgia, and Florida, groves in uninterrupted succession seem to float upon the waters. By the side of the pine is seen the paletuvier, the only shrub which thrives in salt-water — the magnificent lobelia cardinalis, and the odoriferous pancratium of Carolina, with its snow-

white flowers. The land to which the tide reaches are distinguished from the lands which remain dry, by the moving and compressed stalks of the arundo gigantea, by the light foliage of other plants and trees, and by the white cedar, which, perhaps, of all the vegetable productions of America, presents the most singular aspect. Its trunk, where it issues from the ground, is composed of four or five enormous parts, which, uniting at the height of seven or eight feet, form a sort of open vault, from the summit of which rises a single straight stem of eighteen or twenty feet in height, without a branch, but terminating in a flat canopy, shaped like a parasol, garnished with leaves, curiously figured, and of the most delicate green. The crane and the eagle fix their nests on this aërial platform; and the paroquets, while leaping about, are attracted to it by the oily seeds enclosed in the cones suspended from the branches. In the natural labyrinths which occur in these marshy forests, the traveller sometimes discovers small lakes and open lawns, which would present most seductive retreats, if the unhealthy exhalations of autumn permitted him to inhabit them. Here he walks under a vaulted roof of smilax and wild vines, among creeping lianas, which invest his feet with their flowers: but the soil trembles under him, clouds of annoying insects hover around, monstrous bats overshadow him with their hideous wings, the rattle-snake musters his scaly terrors, while the wolf, the carcajou, and the tiger-cat fill the air with their savage and discordant cries.

E. Oh, dear, mamma! — it is beautiful, and yet terrible. I could not be pleased, I am sure, delightful as the trees and flowers are, where there is so much that would frighten me. Are there any other remarkable forests in that country?

Mrs. E. Those parts of the region west of the Alleghanies, which are elevated three or four hundred feet, and lie along deeply depressed beds of rivers, are clothed in some of the richest forests of the world. The Ohio flows under the shade of the plane and the tulip-tree, like a canal dug in a nobleman's park; while the leaves, extending from tree to tree, form graceful arches of flowers and foliage over branches of the river. Passing to the south, the wild orange-tree mixes with the odoriferous and the common laurel. The straight silvery column of the papaw-fig, which rises to the height of twenty feet, and is crowned with a canopy of large, indented leaves, forms one of the most striking ornaments of this enchanting scene. Above all these, towers the majestic magnolia, which shoots up to the height of more than one hundred feet. Its trunk, perfectly straight, is surmounted with a thick and expanded head, the pale green foliage of which affects a conical figure. From the centre of the flowery crown, which terminates its branches, a flower of the purest white rises, having the form of a rose, and to which succeeds a crimson cone. This, in opening, exhibits rounded seeds of the finest coral red, suspended by delicate threads six inches long. Thus, by its flowers, its fruits, and its gigantic size, the magnolia surpasses all its rivals of the forest. The forest scenery of

America is well adapted to excite poetic and devotional feeling. They are admirably blended in a fragment I will read you from the pen of a native of that country.

'Father! thy hand
Hath reared these venerable columns! Thou
Didst weave this verdant roof. Thou didst look down
Upon the naked earth, and forthwith rose
All these fair ranks of trees. They in thy sun
Budded; and shook their green leaves in thy breeze;
And shot towards heaven. The century-living crow,
Whose birth was in their tops, grew old and died
Among their branches, till at last they stood,
As now they stand, massive, and tall, and dark,
Fit shrine for humble worshipper to hold
Communion with his Maker.'

F. How grand! — how grand!

Mrs. E. The poet describes, however, another scene which has its charms.

'Come when the rains
Have glazed the snow, and clothed the trees with ice,
While the slant sun of February pours
Into the bowers a flood of light. Approach!
The incrusted surface shall upbear thy steps;
And the broad arching portals of the grove
Welcome thy entering. Look! the massy trunks
Are cased in the pure crystal; each light spray,
Nodding and tinkling in the breath of heaven,
Is studded with its trembling water-drops,
That stream with rainbow radiance as they move.
But round the parent stem the long low boughs
Bend in a glittering ring, and arbors hide
The grassy floor.'

And then, having compared it to a spacious cavern, 'where the gems grow,' and to 'the vast hall of a fairy palace,' he adds: —

'All, all is light —
Light without shade. But all shall pass away
With the next sun. From numberless vast trunks,
Loosened, the crashing ice shall make a sound
Like the far roar of rivers, and the eve
Shall close o'er the brown woods, as it was wont.'

Mr. E. In Brazil, vegetation is exuberant. But Dr. Walsh shall tell his own tale. 'I now for the first time entered the primeval woods of America, which remain precisely in the state they were left by the receding waters of the flood. I had heard much of the grandeur and sublimity of an American forest; but the reality exceeded my conception. The road, or rather path, winded along the edge of deep valleys and ravines, from the bottom of which trees shot up to a most extraordinary height; and some of them could not be less than 400 feet.

'There is a continued contest for light and air in the vegetable world; and, when numbers of trees are together, they all shoot up with emulation to overtop their neighbors; and, when they have attained that eminence, many of them begin then, and not till then, to send out lateral branches. In this region, where the vital powers of plants are so strong, the contest is carried on with wonderful vigor, and the sap ascends to an incredible distance from the root. In some places, where, either by design or accident, the wood had been burnt down, an insulated tree, perhaps, escaped, and stood by itself, in solitary magnificence at the bottom of a glen: it was then that its gigantic proportions, and the curious structure that accident had given to the process of vegetation, were conspicuous.

'I had the curiosity to leave the path, and ride up to one of these solitary giants, to contemplate it more closely. The stem had run up without putting out a single lateral shoot, till it had ascended above its fellows; and then it pushed

them out horizontally, forming a canopy of branches over their heads; and, when they were burnt away, the canopy still remained, but at such a height that I could but indistinctly see that part of the stem from which the branches issued; and they looked like a little forest suspended in the air.'

E. How curious! Did Dr. Walsh see any others?

Mrs. E. 'Sometimes a tall tree had lost its branches, from fire or some other cause, and the immense stem was covered with climbing plants, which had shot up from the ground, till they had surmounted its summit, and terminated in a point at top; and the whole slender cone of vegetation resembled a very tall cypress — the long pole, that supported so many plants, being itself dead and sapless.

'Some of these creepers had grown up with a young tree, increasing in size along with it, till the two stems were of an equal thickness — the tendrils of the former twining round the neck of its supporter, by a band as dense as the cap of the cross-trees of a man of war; and then shooting above it, like the top-mast from the main-mast.

'When we arrived at the summit of the ridge, we remarked another circumstance in the prolific soil of this country. At the place where vegetation ends, in other regions, it was here in its greatest luxuriance. This vast ridge, I found, was not a chain of rock, but enormous mounds of clay, having a stratum of vegetable soil a thousand feet in depth. It is only necessary,

therefore, to burn down the woods which encumber the ground, and the sloping surface is every where convertible into the richest gardens. We found the very summit treated in this manner. The Marquez de S. Joaco Marcos, who owns large estates on these mountains, has every where begun to cultivate their sides. We crossed an extensive patch, of many hundred acres, on the highest point, just opened in this way; and we emerged, from a primeval forest, into a rich plantation on the very top of the mountain. Much of the burnt timber was yet encumbering the ground; but, between the truuks which lay prostrate, rich plantations of mandioca, milho, and cana, were shooting up their vivid green stems. One of these newly planted tracts had a singular appearance. It was a deep circular cavity, like the crater of a volcano: last year it was a mass of enormous timber, shooting up from the bottom, till the tops of the trees were nearly on a level with the road. It was now a huge cup of rich sugar-cane. The constant humidity of this elevated region gives a security to the vegetation of crops, which they have not always below, where they sometimes fail, and did so this year, for want of rain.'

F. And is not there something more in the volume that will please us?

Mrs. E. Oh, yes, there is much. Here is another extract:—'I accompanied Mr. Watson to see the manner of clearing woods for plantations of milho, or other produce. The woods of these mountains are still in their primitive state, gigantic and dense, and the only mode hitherto tried is fire. We passed through a wild glen,

which opened into a beautiful vale, with gentle slopes up the sides of the hills that surrounded it; we suddenly came out, and, on emerging from a dark avenue of trees, we saw the whole extent of the vale, glowing red, like a vast furnace, of two or three miles in circumference. The indistinct crackling and roaring of the fire was constantly interrupted by loud explosions, and discharges of smoke, which I thought proceeded from blasting rocks or trees with gunpowder, but it arose from a different cause. The woods abounded with bamboos of an immense size, called tacwara. As the fire seized these enormous tubes, the heated air within expanded, and every joint in succession burst open, with a noise as loud as the discharge of a musket. The progress of the flame is followed by negroes, with hoes in their hands, who strike the ashes, when sufficiently cool, into the soil, and immediately drop the grain; and, so rapid is vegetation, when quickened by this process, that young blades of green corn are seen shooting up among the black and smoking stumps in one place, while the fire is raging in another.'

And now, my dears, we have passed from the lowest to the highest grade of vegetation. At a future time, mamma and I will be happy to direct you in other and more profound researches.

E. I am sorry — I am quite sorry, mamma, that we have gone through the vegetable world so soon; I wish we had to begin again.

F. I will tell you, Emma, how we can manage. We shall often find a plant which we don't

know, or something about which we want to hear more; and then we know to whom we can go — don't we, love?

E. Oh, *yes!* And perhaps papa will think of something else for us while we learn a little now and then.

Mrs. E. Papa has already done so, dear. Shall I tell you what it is? — I see your anxiety. He means to give you some account of the treasures of the earth.

E. Oh, I'm delighted — I'm delighted! Only think, Frederick — THE TREASURES OF THE EARTH! — THE TREASURES OF THE EARTH!

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